MACHINE TOOL BLUE BOOK

OCTOBER 1944

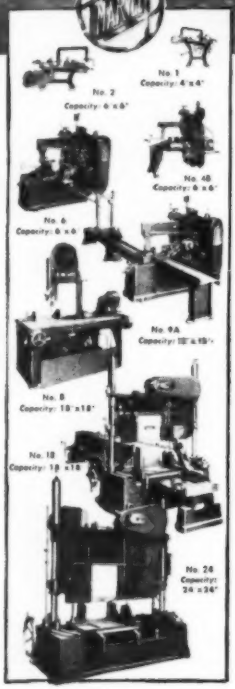
8926
21



Performance has established leadership for HARDINGE High Speed Precision Lathes for Instrument Work in the Aircraft Industry . . .

HARDINGE BROTHERS, INC., ELMIRA, N. Y.





The No. 8 MARVEL Band Saw does the "Impossible"

This "impossible" job required the cutting into 12 equal sections of a cast steel ring 42" in diameter. The ring was to be an expanding chuck for stretching and sizing automobile tire rims. Each ring weighed 750 pounds, the length of the cut was 15" and the thickness of the material at the hub was over a foot in thickness. The sectioning of this ring with ordinary equipment was "impossible" because of the high cost involved and the special handling fixtures needed.

The Chicago Gear Mfg. Co., whose MARVEL Saws, including a No. 8 Band Saw, could take this job because, with this saw's broad planer-type bed, no special setting-up fixtures or tools were required and the regular operator could service this machine without interference with his regular work.

The MARVEL No. 8 handles all work up to 18" x 18" cross section and does cutting-off, mitering and notching. The blade feeds into the work at any angle from 45° right to 45° left. It is the most versatile metal-cutting saw built.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave., Chicago 39, U. S. A.
Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

COMPARE HOBART
for Ease of Control "AT THE WELD"





YES, IT'S "SIMPLIFIED" ARC WELDING ...and no effort at all to get the right voltage and amperage combination for every type of work. The remarkable stability of the arc and the handy controls make it the favorite of all weldors.

EXCLUSIVE DUAL CONTROL AND REMOTE CONTROL.....can be found on no other arc welders. Just think, 1000 combinations of voltage and amperage without a single dead spot. Besides this close control feature, you also get remote control with Hobart which makes adjustments possible at great distances from machine.

THERE'S NO GUESSWORK WITH A HOBART! It's a cinch for veterans and beginners alike to get the right welding values, in fact, as easy to get as the right station and the right volume on your radio.

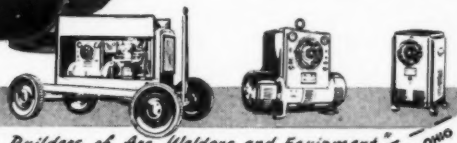


HOBART ELECTRODES AND WELDING MACHINES.. ...are the complete answer to your welding problems. Weldors everywhere like Hobart electrodes for their weldability and characteristics for making strong, ductile welds.



HOBART BROTHERS CO., Box TH-104, TROY, OHIO

"One of the World's Largest Builders of Arc Welders"





One of the World's Largest Builders of Arc Welders and Equipment

HOBART
"Simplified"
ARC WELDERS

HOBART BROTHERS CO., BOX TH-104, TROY, OHIO

☐ Check here for Catalog showing Hobart line.

Please send me information on items checked, without obligation.

☐ Gas Drive Welder.
☐ Electric Drive Welder.
☐ "Practical Design" Sheets
☐ Vest Pocket Welder's Guide.

Name _____

Position _____

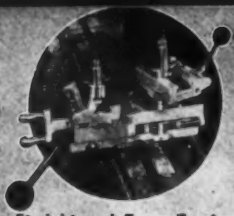
Address _____

Remarks:

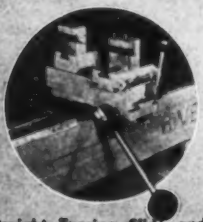
BUY MORE WAR BONDS!

RIVETT

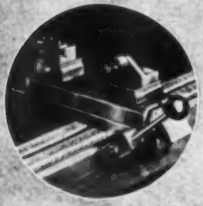
FOR BAR OR INDIVIDUALLY CHUCKED WORK REQUIRING UP TO EIGHT SUCCESSIVE OPERATIONS



Straight and Taper Turning Slides



Straight Turning Slide and Fixed Block



Cutting-Off and Forming Blocks

The Rivett No. 915 Hand Screw Machine incorporates precision, balanced design and operating features to make it an efficient producer on small duplicate parts. Work requiring up to eight successive operations can be finish-machined at one chucking. Bar stock passed through spindle may be held in push-out collet, while work individually chucked may be held in draw-in collet, step chuck or jaw chuck. In combination with six turret operations, double tool slide may be set up for straight or taper turning, forming or cutting-off.

Other combinations are available using chasing bar for internal or external threading, or compound slide rest with turret tool post. Steel cabinet mounting has rimmed top and sump for cutting oil. Bench mounting is optional.



SPECIFICATIONS

Swing over bed, dia.	9"
Distance between spindle nose and face of turret	
With draw-in collet	14½"
With push-out collet	13½"
Collet capacity:	
Draw-in type, max. dia.	1"
Push-out type, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1¼"
Travel of turret slide, max.	4½"
Number of tool holes in turret	6
Dia. and depth of tool holes	¾" x 1"
Swing over double tool slide	6½"
Cross travel of double tool slide	3"
Travel of straight turning slide	2¼"
Travel of taper turning slide	2¼"
Spindle speeds, eight forward and reverse:	
Low range	150 to 2500 r.p.m.
High range	225 to 3750 r.p.m.
Weight of hand screw machine, mounting and drive, net	900 lbs.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.



Style "B" Master Feed Fingers and Pads

HARDINGE Precision Collets and Feed Fingers for all makes of Automatics, Turret Lathes and Chucking Machines



Style "S" Sure-Grip Master Collets and Pads





HARDINGE
ELMIRA, N.Y.



HARDINGE Precision Collets for all makes of Lathes and Milling Machines



"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

ARMSTRONG



They still don't know the capacity of an ARMSTRONG TOOL HOLDER

War urgency has led to a phenomenal stepping-up of speeds and feeds on lathes, planers, slotters and shapers. Some operations are now being done on the same equipment in half or even less the time which was thought to be "required" in prewar days. Still in no case have they reached the ultimate capacity of their ARMSTRONG TOOL HOLDERS.

So designed that the machine with greatest efficiency, with greatest convenience, maximum clearance, maximum visibility . . . with simple, inexpensive cutter-bits any mechanic can quickly grind from stock shapes of high speed steel, ARMSTRONG TOOL HOLDERS still have strength beyond any need, have capacity beyond that of the machine tools on which they are used.

For more production per man and more pieces per machine, tool completely with ARMSTRONG tool holders. Keep up with war time requirements; be equal to the speeded-up post-war competition.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

308 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Warehouse & Sales Offices:
199 Lafayette St., New York 12, N. Y.

Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

Published Monthly *Volume 40, No. 10*

OCTOBER 1944

Featured in This Issue 129

Editor's Page 131

The Art of Metal Cutting 133
By Dr. H. A. Frommelt

Carbide Milling of Steel 157
By H. L. Pope

Some Brazing Tips 173
By Lawrence D. Jennings

Fundamentals in Milling Practice 199
By Dr. H. A. Frommelt

1944 Metal Congress 237

"Let's Talk Shop" 243

What's New in Metal Working 284

Mechanics Through the Ages 406

Index to Advertisers 414-418

CCA

R. C. Van Kampen, President
J. E. Hitchcock, Vice President
M. L. Yonts, Secretary
Wesley G. Paulson, Editor
C. E. Elzinga, Circulation Mgr.

Representatives
W. E. Hoffman, Portland, Conn., Phone: 2946
A. E. Wailes, 55 W. 42nd St., N. Y. 18, N. Y., Phone: Lackawanna 4-4528
D. B. Trott, 2187 Olive Ave., Lakewood 7, Ohio, Phone: Boulevard 8844
A. C. Feigert, 303 Evans-Central Bldg., Van Wert, Ohio, Phone 2342
R. H. Deibler, 403 W. 8th St., Los Angeles 14, Cal., Phone: Tucker 1579
H. J. Smith, 542 S. Dearborn St., Chicago 5, Ill., Phone: HARrison 6040

(Copyright 1944, by Hitchcock Publishing Co., Chicago, 5, Ill.)

Phone: HARrison 6040 Cable Address: HITCHPUB



POWER MIGHTY AIR THRIFTY

Thor

PORTABLE AIR GRINDERS

FOR FAST, EASY WORK... AT LESS COST ON EVERY GRINDING JOB!

For *power* that gets all types of heavy duty grinding done faster, easier . . . for *money saved* through the advantages of "measured air" performance and sturdy, sealed construction that insures longer service, Thor Portable Air Grinders offer these "Power Mighty-Air Thrifty" features on *every job* in shop and foundry.

Thor Air Grinders are available in a complete range of sizes and models, carefully graduated as to weights, lengths, speeds and wheel capacities. Heavy duty models shown here can be furnished with straight, grip or lever throttles.

LOOK AT THE RANGE!

Weights.....18 oz. to 24 lbs.
Lengths.....8½" to 39"
Speeds.....3,000 to 21,000 r.p.m.
Capacities.....1½" to 8" dia. wheels

END EXHAUST eliminates exhaust holes or slots from cylinder bushing, reducing wear of rotor blades to an absolute minimum.

MUFFLER FOR EXHAUST effectively cuts down high pitch noise.

LARGE OIL CHAMBER economically supplies the motor with correct amount of oil, giving blades and cylinder bushing longer life.

QUICK-ACTING GOVERNOR AND VALVE controls the speed of the rotor and prevents racing of spindle when it is running without load.

AIR BEHIND THE BLADES keeps them out against the cylinder wall, preventing "dead center" position and consequent power starting.

DYNAMICALLY BALANCED ROTOR. Solid one piece construction gives greater depth for blade slots and better balancing.

HEAVY, RIGID SPINDLE prevents spindle whip between bearings. Thor bearings run cool and last far longer.

LABYRINTH SEAL. Keeps dirt out and grease in. Lasts the life of the machine.

Write today for complete specifications and information of Thor Portable Air Grinders and other Thor Air Tools for industry in Catalog 83-B.

Thor Portable Pneumatic and Electric Tools

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.
Branches in Principal Cities



Jones & Lamson Optical Comparator being used to inspect the thread of a vital airplane part.

Making Mountains out of Molehills!

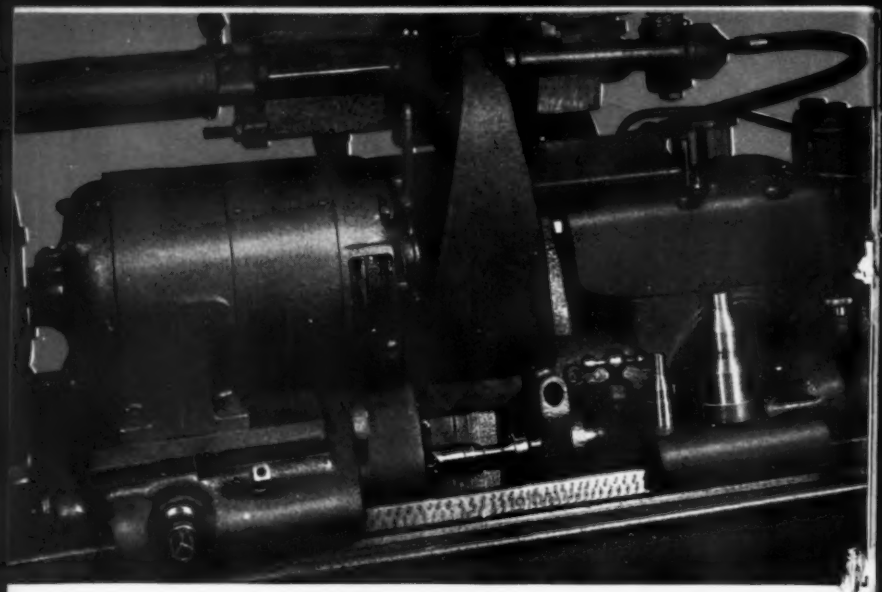
There are people who *must* make mountains out of molehills. They are those who must detect and measure the microscopic irregularities that would, if undiscovered, swell scrap heaps, retard production and even endanger lives.

Jones & Lamson Optical Comparators enlarge minute imperfections to conspicuous size. By the use of the Comparator, inspectors of tools and products can *see* and *measure*, accurately and quickly, faults that might elude other means of inspection.

Jones & Lamson Optical Comparators are made in various models to meet every need. Ask Jones & Lamson inspection engineers how you can use them to expedite and improve inspection in your plant. Ask them today!

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



Infeed PROFILE GRIND

Four Diameters and Two Bevels on Cincin

Grinding four diameters and two bevels, all at the same time by the infeed method, is quite a job, especially when necessary to hold a tolerance of .0005". To handle this type of work, CINCINNATI Application Engineers tooled up a CINCINNATI 6" Plain Hydraulic Grinder with the following equipment:

1. Profile hydraulic wheel truing attachment.
2. Extra wide wheels, with suitable wheel mounts and guards.
3. Hydraulic footstock.
4. Automatic infeed attachment.

The equipment is designed to handle two shafts; one having four diameters and two bevels, and the other having three diameters and one bevel. Although the machine is comparatively small, its FILMATIC spindle bearings and

THE CINCINNATI MILLING MACHINE CO.

...OL ROOM AND MANUFACTURING MILLING MACHINES...SURFACE BROACHING MACHINES...CUTTER SHARPENING



Above: Sketch of the larger of two shafts. Notice the four different diameters; all of them, including the bevels, are ground at the same time by the infeed method. There are three diameters on the smaller shaft.

Left: Close-up showing Profile Hydraulic Wheel Truing Attachment over the grinding wheel of a standard CINCINNATI 6" Plain Hydraulic Grinder. This equipment is arranged to infeed (plunge cut) profile grind two sizes of shafts, samples of which are standing on end on machine footstock.



ING

nati 6" Plain Hydraulic

overall rigid construction make it possible to take these unusually wide cuts. Here again, CINCINNATI Application Engineers have demonstrated that standard machines, slightly modified, or with extra equipment, are suitable for precision grinding special jobs. Perhaps some precision operation in your manufacturing process could be handled more efficiently. Why not talk it over with the engineers here at Grinding Headquarters?

Above: CINCINNATI 6" Plain Hydraulic Grinding Machine. Catalog G-492-2 gives complete specifications. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED CINCINNATI OHIO, U.S.A.

MACHINES . . . CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHINES

NOW AVAILABLE

FOR Shaper Training...

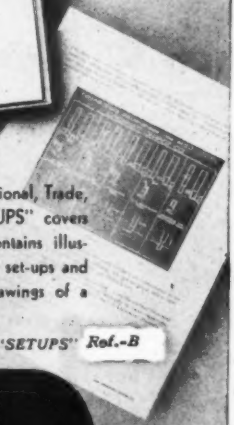






SETUPS
ON
CINCINNATI SHAPERS





A valuable instructive booklet for Vocational, Trade, and Industrial Training Schools. "SETUPS" covers basic operations on the Shaper—it contains illustrations and text on fundamental Shaper set-ups and shaper tools; also photographs and drawings of a variety of jobs.

Write for your copy of "SETUPS" **Ref.-B**

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



EASIER TO OPERATE . . .

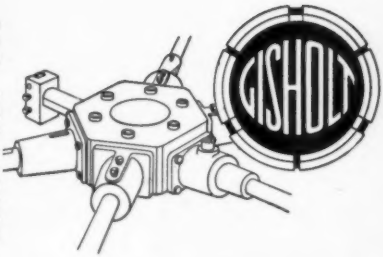
Many functions are automatic

EVERYTHING about these modern Gisholt Ram Type Turret Lathes has been simplified to make them easier to operate . . . to eliminate waste time . . . to reduce fatigue . . . to speed up production.

Such advantages as automatic spindle-braking, automatic indexing and clamping of the hexagon turret, and selective automatic speed changing relieve the operator of many motions and cut the lag in machining time.

We couldn't, in one short advertisement, begin to enumerate all of the time and effort-saving refinements which have been perfected through 60 years of building and using Gisholt Turret Lathes. But they are facts that you should know—for faster, easier production *now*, and in the years ahead.

Ask a Gisholt engineer to tell you about them. Or write for descriptive literature.



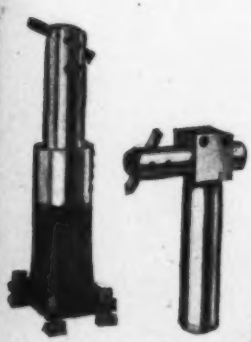
GISHOLT MACHINE COMPANY
1185 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements
in Metal Turning

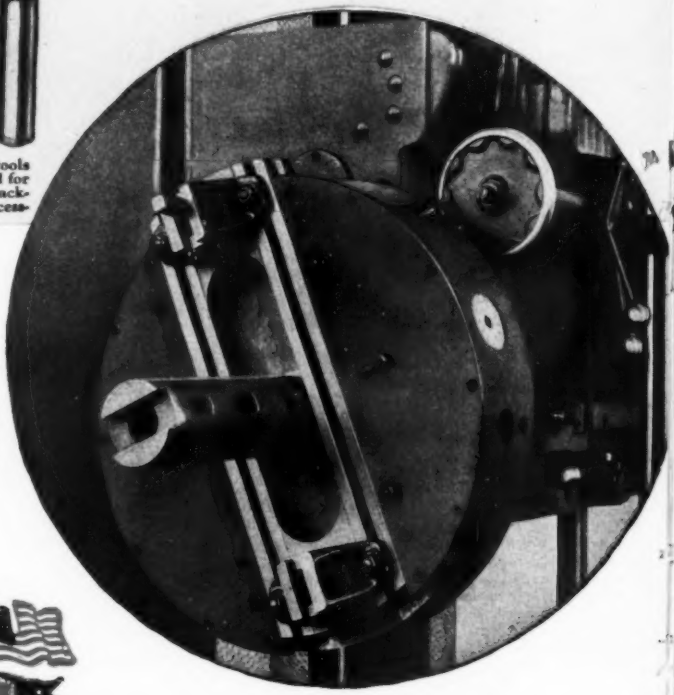
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Internal Operations

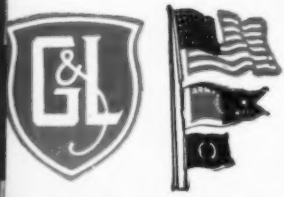
..... *can be machined easily with this* Continuous Feed Facing Head



(Above) Telescopic tools and tool holder, used for special boring, facing, back-facing, turning and recessing operations.



(Right) G. & L. Continuous Feed Facing Head mounted on horizontal boring machine headstock. Cutting tools are shown bolted to tool slide.



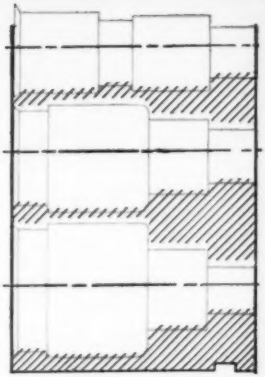
GIDDINGS & LEWIS

144 DOTY STREET

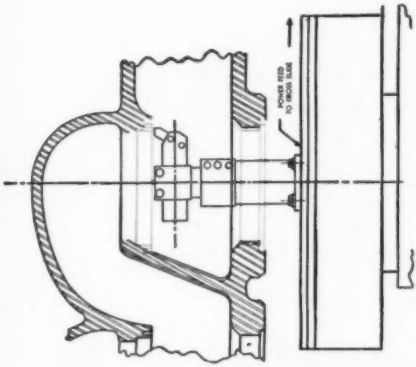
● The Continuous Feed Facing Head simplifies those jobs where it is difficult to watch the cutting tool during the machining cycle. Power feeds to the tool slide, feed selector, directional control and micrometer adjustment on this attachment adapts it for unusual boring, facing, counter-boring and recessing.

In addition, the design of the Continuous Feed Facing Head makes it possible to combine boring and facing operations, thus reducing overall production time.

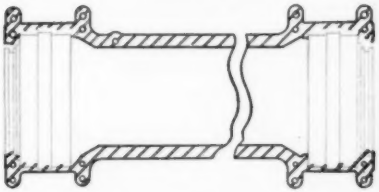
You may have need for this flexible, time-saving attachment in your own plant. Our engineers will be glad to show you how to widen the productive range of your horizontal boring machine with it. There is no obligation for this help.



To insure proper mating of this forging die, the two halves were machined at the same time. Three separate cavities were made with the Continuous Feed Facing Head. By using micrometer adjustments and power feeds, it was possible to recess the dies in one-third the time required by former machining methods.



Here is a difficult-to-see internal facing operation where the external bore is smaller than the bore being machined. The Continuous Feed Facing Head with power feed simplifies this operation. The cutter is fed outward.



This is a bearing retainer for a locomotive axle housing. The two halves of the housing are bolted together for machining. All roughing and finishing operations are completed on one end first, the housing is then turned and the same operations repeated.

FREE DATA — Continuous Feed Facing Head information is contained in Bulletin No. BB104. Write for your copy today.



MACHINE TOOL COMPANY

FOND DU LAC, WIS.

Hex or square...standard or special nuts... it's all the same to Apex!



SIZES—$\frac{3}{8}$" to 1$\frac{1}{2}$" (Universal Joint Sizes).

SOCKETS—Hex or double hex—square or double square ($\frac{1}{4}$" AF and up).

SHANKS—To fit any type drive (electric, air or impact).

STYLE—With or without tension sleeve.

WORKING ANGLE—35% (No binding or breaking at maximum working angle).

HARDNESS to your own Rockwell specifications if you like.

We're tooled up for speed and flexibility. Apex also makes Universal Socket Adapters, Universal Joints, Phillips Bits and Screw Drivers, Production Tools for drilling, tapping, reaming and stud setting. *Write for Catalog 14.*

THE APEX MACHINE & TOOL COMPANY
DAYTON 2, OHIO

APEX

Socket Wrenches

Jarvis High Speed Tapping Attachments

Jarvis Tapping Attachments are built for high speed production. Famous for long tap life and extreme accuracy, they will give dependable and efficient service.

When you use Jarvis High Speed Tappers, you save "time and taps".

Send for New Catalog MFTI



Jarvis POWER TOOLS

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
QUICK CHANGE CHUCKS AND COLLETS

QUICKER!
SAFER!
EASIER!

CUT PIPING!
CUT GIRDERS!
CUT SOLIDS!



FACTORY: Albion, Mich.

Wet-Cutting Model Also Available for Ultra High Speed Metal Cutting

Prompt Deliveries

Capacity 10" x 18", Hydraulic Controls
Constant Feed, ½ H.P. Motor

JOHNSON METAL CUT-OFF BANDSAW

Metal sawing is a more efficient operation with the Johnson Saw. Designed for quick set-up; adaptable to practically every kind of cutting job. 3-point base for anchorage on uneven flooring.

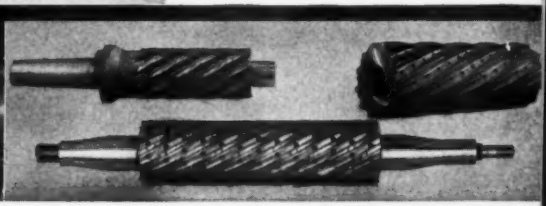
Write today for descriptive folder to Sales Office:

JOHNSON MFG. CORP. 5000 CHRYSLER BLDG. NEW YORK 17, N. Y.

INGERSOLL HELICAL CUTTERS

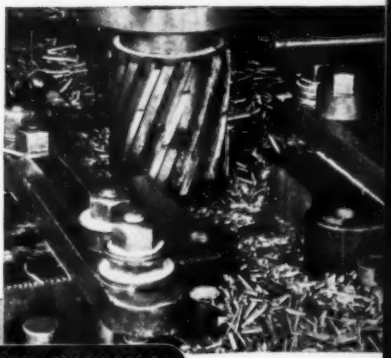
Ingersoll offers the only true inserted blade *helical* cutters. Blades are forged, twisted, hardened, and then ground to a true helix to accurately fit helical milled slots in the body. Cutter blade presents a constant rake angle to work, with steep helical or shearing angle, enabling cutter to mill with minimum of power. Several teeth are always in the cut. This and shearing action of helical teeth gives smooth finish at high feeds.

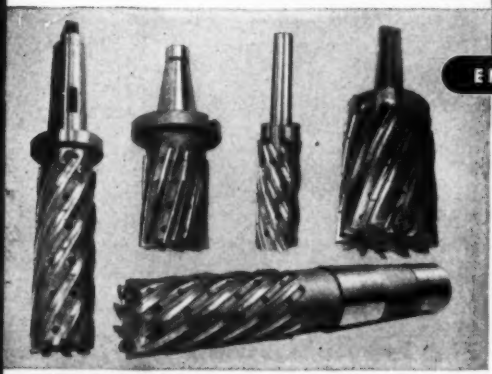




SLAB MILLING

Slab milling of wide surfaces is best performed with Ingersoll inserted helical blade cutters. These slab mills are used on the arbors of knee type machines as well as on large heavy duty Ingersoll slabbing machines as illustrated. These inserted blade slab mills are replacing many solid high speed steel types due to the economy of using renewable blades.





END MILLING

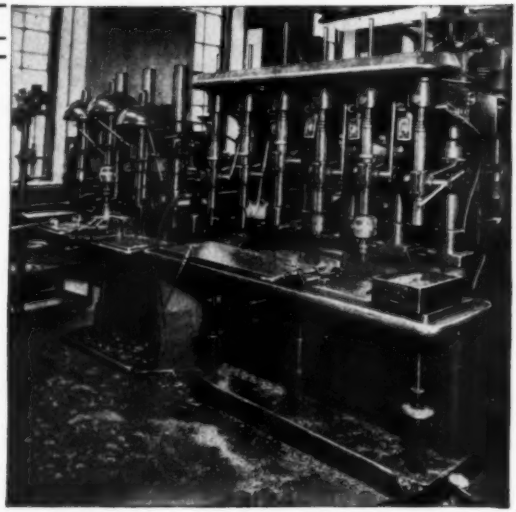
Ingersoll helical end mills are an efficient and renewable inserted blade cutter for milling wide surfaces on the periphery while end milling. Cutter furnished with slow positive helix angle for cutting on both face and periphery. When milling on periphery only, a high reversed helix angle is preferred to direct thrust back against machine spindle. Replacement blade costs are low.



Send for Engineering Specification Sheets describing complete line of Ingersoll standard inserted blade milling cutters.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

Straight Line set-up for fast, accurate drilling



The advantages of straight line set-up of drills of various sizes to handle production drilling are well-known to factory managers. More and more shops are using Buffalo drills for this type of work, because:

1. "Buffalo" builds a wide line—from the No. 15 Bench Drill to the husky motor spindle.
2. Buffalo Drills are "production" tools—heavy-duty construction is an important characteristic of "Buffalo" design.
3. Operators like the simplicity of Buffalo controls—scientifically placed to save motion.
4. Quantity production prices Buffalo drill moderately.

If your post-war plans call for new drilling equipment, send for the Buffalo Drill Binder which shows the complete line of single and multispindle bench and floor types, and complete prices.

"Buffalo"

Buffalo Forge Company

161 Mortimer St., Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Single and Multispindle Drilling Machines

Short Cut ON MACHINING NITRIDED STEEL

SUNOCO
EMULSIFYING CUTTING OIL
speeds cutting of aircraft cylinders at 266 S.F.P.M.

Shortening the cutting time on vital machining operations is one important way Sunoco Emulsifying Cutting Oil is aiding our successful war production effort.

Airplane engine cylinders, for instance, were needed in a hurry. Working with tough nitrided steel, on Jones and Lamson 16" Heavy Duty Fay Automatic Lathes, a cutting lubricant was needed that would permit maximum cutting speed . . . without sacrificing accuracy or finish. On the basis of past experience a 20 to 1 mixture of Sunoco was recommended. The results speak for themselves. The 3/16" cut was made at a speed of 266 S.F.P.M., with all other requirements satisfactorily met.

Flooding tools and work with Sunoco Emulsifying Cutting Oil has been a universal means of speeding cutting operations for years. Sunoco's high heat-absorbing and lubricating qualities make possible longer tool life, greater accuracy, and finer finish. Today, in your own shop, under your own operating conditions, the advantages of Sunoco can be applied wherever a soluble cutting oil is used. Sun Cutting Oil Engineers — experts in solving metal working problems — are at your service to analyze your cutting oil needs and make proper recommendations. Call your nearest Sun Oil Company office or write

SUN OIL COMPANY • Philadelphia 3, Pa.
Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

PERFORMANCE DATA

OPERATION—Machining Airplane Engine Cylinder.
MACHINE—Jones & Lamson 16" HD Fay Automatic Lathe.
MATERIAL—Nitrided Steel. SPINDLE SPEED—116 R.P.M.
CUTTING SPEED—266 surface feet per minute. FEED—.018 inch.
DEPTH OF CUT—3/16 inch. TOOLS—12 Cemented Carbide.
CUTTING LUBRICANT—1 part Sunoco to 20 parts water



SUNOCO **SUN INDUSTRIAL PRODUCTS**

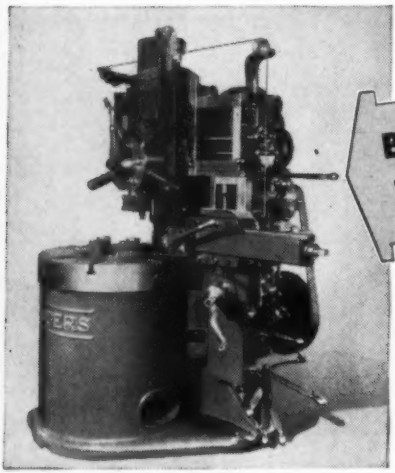
HELPING INDUSTRY HELP AMERICA

ROGERS "Perfect 36" VERTICAL TURRET MILLS

Built to outlast wars



Built in 1898 *and still in use*



Built in 1944

Many Rogers Mills built before the turn of the century are still in operation. Advanced design, fine workmanship, high quality materials, and precision manufacturing techniques are the reasons these mills have outlasted several wars.

59 years of engineering achievements is one of many reasons why you can bore, drill, thread and turn ferrous and non-ferrous castings and forgings *quicker, cheaper and with greater precision.*

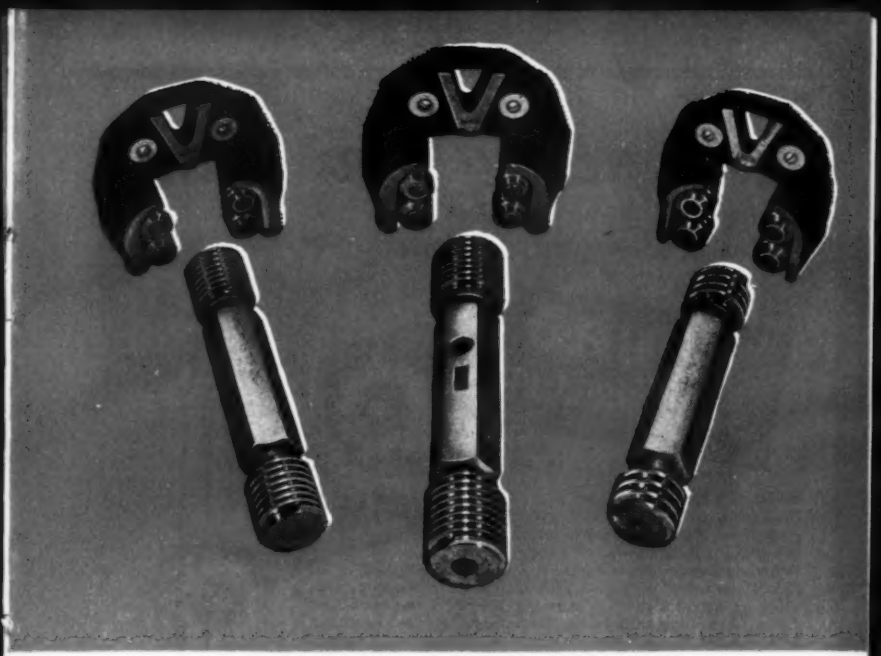
Compare Rogers LOW INITIAL COSTS by writing for fully illustrated Catalog TODAY.

ROGERS MACHINE WORKS, INC.

Sales Office: 1813 Elmwood Avenue Buffalo 7, N. Y.

Factory: Alfred, N. Y.

Knowing How Since 1885



VARD ACME GAGES

The newer, larger aircraft are causing a tremendous demand for Acme Thread Gages to check mechanically actuated control parts, lead screws, etc.

VARD is making these Acme Thread Gages in plug, ring and roll thread snap gage types. Sizes run from ¼ in. diameter to as large as you may require. Gaging members are made of selected tool steels. They are hardened in atmospheric controlled furnaces. All gaging surfaces are ground and finished to the same accuracy and tolerances as V threads. All VARD gages will meet the specifications as set up by Screw Thread Standards for Federal Services.

We can handle orders in quantity and guarantee quick service (by present day standards).

VARD Acme thread snap gages are equipped with John-Sons type rolls and the improved VARD frame. VARD Acme plugs are equipped with lightweight metal handles and are made in taper-lock, tri-lock and annular types.

VARD INC

PASADENA 8, CALIF

Everything you want

in this new, rugged, accurate

DURO 18-inch DRILL PRESS



●Here's a new husky low-cost DURO drill press that can handle efficiently a wide range of drilling and tapping jobs—or be easily adapted for many specialized operations.

Has Many Outstanding Features—Special design permits quick changing of belts. Has six-spline telescopic, self-aligning spindle that reduces play. Production table has 14" x 18" machined surface. Efficient production foot feed available. Heavy base with 12" x 12" machined surface. Specifications include: ¾" capacity. No. 2 Morse Paper. 4 New Departure Ball Bearings. Speed range 425 to 2030 R.P.M. Spindle travel—5". Drills to center of 18" circle. Maximum distance from base to spindle—49". Maximum distance from table to spindle—19". Overall height—68". Size of overall base—18" x 28½". Diameter of column—3½". Weight of Model A3088 (as illustrated) less motor, 350 lbs. Also available in bench model.



Send for New Complete DURO Catalog

showing low-cost single and multi-spindle Drill Presses, Metal-Cutting Band Saws, Circular Saws, Jointers, Router, Shapers, Grinders, Lathes, Scroll Saws, Flexible Shaft Units, and Portable Electric Drills. Gives full specifications and prices.

Duro Metal Products Co.,
2697 N. Kildare Avenue, Chicago, Ill.

Gentlemen: Please send me FREE copy of latest DURO Catalog giving full specifications on new DURO 18-inch Drill Press and other DURO Machine Tools.

*Name*_____

*Address*_____

*City*_____ *State*_____

DURO TOOLS

MACHINE TOOL DIVISION

ALSO MAKERS OF DURO HAND TOOLS



BUY U. S.

WRITE US FOR CATALOG SHOWING HYDRO-PIERCE APPLICATIONS

"PIERCE-FORM WITHOUT A PRESS"

Mid-West Hydro-Pierce methods assure better alignment and accuracy of pierced parts at assembly. Above you will see how the Automobile Industry applies this to fenders.

MID WEST HYDRO PIERCE INC.

8201 ST. AUBIN, DETROIT 11, MICHIGAN

MADISON 6824

THE ADVANTAGE OF *Experience* IN THE MANUFACTURE OF THIS TYPE OF PUSHER



IS OFFERED *Only* BY MODERN COLLET

Pushers with multiple spring grips to maintain proper feeding tension have been standard products of Modern Collet for many years. The unquestioned superiority of Modern Pusher performance is seen in the fact that, in the past few years, more of these pushers have been used throughout industry than all others combined.

These are the pushers that receive *exactly* the right heat treatment... that have a long, flat surface grip . . . that can be tightened, when they become loose through wear, to any desired tension without the use of special tools . . . that are made from special analysis steel. A single pusher may be used for either round and hexagon or round and square stock, permitting a minimum pusher inventory.

To be sure that the pushers you use today possess the proven features and provide the efficient performance assured only by long manufacturing experience, insist *always* on Modern Pushers.

MC MODERN COLLET and MACHINE CO.

401 SALLIOTTE STREET • ECORSE, MICHIGAN

Keep Wheels of Industry Rolling with KEMPSMITH *Standard* ATTACHMENTS



Convert your general duty milling machine to a special purpose mille by utilizing Kempsmith Standard Attachments.

It's really surprising, the great variety of milling operations that can be handled by Kempsmith *Standard* Attachments mounted on a standard milling machine. The same high degree of rigidity and precision characteristic of Kempsmith Milling Machines for more than 50 years is embodied in these sturdy standard attachments. Thousands are serving industry, every day, performing the most delicate and accurate operations, or handling difficult production milling jobs.

So plan now on broadening the scope of YOUR milling machines by applying Kempsmith Standard Attachments. Write for bulletins designated above.

THE KEMPSMITH MFG. CO. • Milwaukee 14, Wis., U.S.A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

FASTER Tapping with Less Tap Breakage

Special design, improved dry-clutch and precision workmanship make Procunier Tapping Machines *so sensitive that even* unskilled operators can detect an overloaded or dull tap — or determine instantly when tap hits bottom of hole. That means greatly decreased tap breakage. Other features of Procunier design that assure faster, more accurate tapping are: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF THE OPERATOR; Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads.



Tap Establishes Its Own Lead

The new Procunier Universal Tapping Machine is exclusively designed so that it actually allows the tap to establish its own lead. There is nothing more accurate than a precision ground thread tap as a guide for tapping—so maximum tapping efficiency is attained where an accurate tap is free to establish its own lead in cutting the thread.

Send for Special Bulletin

giving full details and prices on the full line of Procunier Universal Tapping Machines, Procunier Precision Tapping Heads and the new Tru-Grip Tap Holder.

PROCUNIER
For Faster, More Accurate Tapping

THE PROCUNIER SAFETY CHUCK CO.,
14 S. Clinton St., Chicago

Send me bulletins on: ☐ Universal Tapping Machines, ☐ High Speed Tapping Heads, ☐ Tru-Grip Tap Holders.

Name .....

Address .....

City ..... State .....

MAIL THIS COUPON TODAY

INCREASE MILLING PRODUCTION without Added Men or Machines!

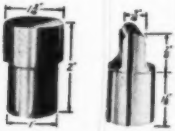


MODEL 10-E
Pat. Applied for

Before After

Aluminum Parts

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before After

Chrome Steel Parts

These parts, high heat treated of Chrome-moly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

These parts milled with the use of the Aerco Multi-Grip Chuck show its versatility.

with the AERCO HYDRAULIC MULTI-GRIP CHUCK

Two rows of collets hold ten parts and both rows are milled simultaneously and with but a single loading increasing production as much as 500%.

Self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations. Safety stop prevents damage to collets should all stations not be loaded.

Aerco Multi-Grip chucks may be used for both vertical and horizontal milling. Work is held rigidly in collets and cannot turn or be pulled out during milling operation, however clamping pressure is instantly releasable and self-opening collets can be quickly re-loaded

Collet sizes range from ⅛" to 1¼" and are available in round, square or hexagon shapes.

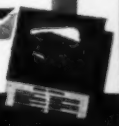
Representatives Wanted in Principal Cities

MANUFACTURED EXCLUSIVELY BY

AERCO CORP

HOLLYDALE, CALIFORNIA

ARMY E NAVY



WRITE FOR NEW FOLDER

A NEW, *Completely Revised Catalog* OF LINCOLN PARK PRODUCTS



★ Provides quick and unmistakable selection of every standard type, size, and price of gage and tool manufactured by Lincoln Park.

★ Carries full information and lists complete range of gages produced in Carboloy, chrome plate and steel gages salvaged by chrome plating.

★ Includes all of the newest products of Lincoln Park such as Carblox in U.S.A. and Hoke types, serrated anvils, and Carburs.

★ Incorporates complete section on "American Gage Design Standards."

A copy of this valuable book is now ready for you. It will be supplied either by your Lincoln Park representative or on request directly to the factory. There is no charge or obligation. Requests by mail must be made on company letterheads.

Sales Representatives of Lincoln Park Industries, Inc.

FRED P. BRAZIL
312 Circle Tower Bldg.
Indianapolis 4, Ind.

P. D. BROWNE COMPANY
1124 Allen Building
Dallas 1, Texas

WALTER F. CAHILL CO.
645 New Center Bldg.
Detroit 2, Mich.

GENERAL TOOL SALES
3945 N. Broad St.
Philadelphia 40, Pa.

ROBERT W. GLOYD
1217 E. Third Street
Dayton 2, Ohio

JAMES H. GRIFFIN
5224 Pacific Blvd.
Huntington Park, Calif.

M. J. LLOYD
4500 Euclid Avenue
Cleveland 3, Ohio

JERRY MEANS
1922 15½ Street
Rock Island, Ill.

O. A. MUENZ ENGINEERING CO.
790 Broad Street
Newark 2, N. J.

O. A. MUENZ ENGINEERING CO.
932 East Main Street
Bridgeport 8, Conn.

JAMES S. MURRAY
Box 8029, Station 16
Pittsburgh, Pa.

QUINN & QUINN
1720 Comer Building
Birmingham 3, Ala.

WM. H. SCHEER
7430 Bruno Street
St. Louis 17, Mo.

MILTON A. SIEBERT
12 Bay View Road
Wellesley 81, Mass.

WALTER F. STEGNER CO.
20 North Wacker Drive
Chicago 6, Ill.

WALTER F. STEGNER CO.
757 North Broadway
Milwaukee 2, Wis.

J. ROLLAND STEWART & ASSOCIATES
918 University Building
Syracuse 2, N. Y.

CHAS. W. STONE COMPANY
1019 Marquette Avenue
Minneapolis 2, Minn.

ARMY (E) NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1731 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

Save Costly Tie-Ups of Large Production Units with this

LOW-COST, VERSATILE SAW

SPECIFICATIONS
WELLS No. 8

CAPACITY: Rectangular . .	8" x 16"
(Special Guides) . . .	5" x 24"
ROUNDS:	8" diameter
MOTOR: . .	½ H. P. current optional
SPEEDS: Selective 60, 90, 130 ft. per min.	
WEIGHT: . .	Approximately 750 lbs.

You can avoid costly tie-ups of large, special production units in your plant by using a Wells No. 8 Band Saw for odd metal-cutting jobs. It can be used on production . . . in stores or tool rooms . . . or on maintenance work.

The Wells No. 8 with 3-speed selection insures efficient operation. Gravity feed and automatic shut-off allows one man to operate 2 or more Wells Band Saws.

Low first cost, installation and power cost. Simple, rugged construction insures long life—minimum upkeep.

See your Distributor or write direct for complete details on this versatile, low-cost metal-cutting band saw.



Wells Saws

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

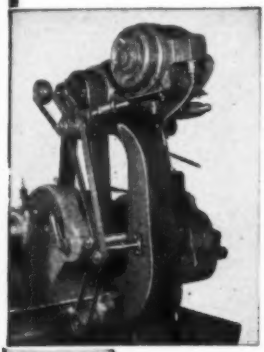
WELLS MANUFACTURING CORPORATION
707 COOLIDGE AVENUE, THREE RIVERS, MICH.

Cut Costs with

Berkeley DRIVES

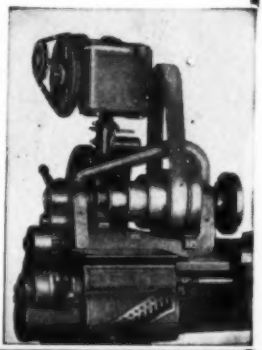


Production Costs will loom large in the post-war world. Competition will be keen. Labor costs will be high. Increased manufacturing efficiency is one of the important answers. The obvious course is to drive your machine tools at their most productive speeds, taking full advantage of the latest carbide tooling.



Berkeley can give you just the type of drive needed to get maximum production from each of your machine tools. Berkeley Drives are not "hand me downs". They are engineered and built specifically for your tools. That's why they're easy to install without any extra gadgets — why they give you the utmost from your machines and your workers.

Berkeley Drives are built to "take it". Maintenance cost is trivial. Berkeley Drives soon pay for themselves through savings which they make possible — and thereafter deliver a net profit, during dependable, life-time service.



LET US SEND YOU DETAILED FOLDER

BERKELEY

Without obligation on your part, let Berkeley tell you how to get more work and more profit from your machines and men.

Equipment Company

1022 BAHLS ST.
DANVILLE, ILL.

Get 3 to 5 times MORE WEAR per Grind!



CIRCULAR RELIEF GRINDING LEAVES NO "LAND"... GIVES YOU LONGER-LASTING EDGES

Why? Because each regrind is *better* than the conventional or "factory" grind. Not only do you receive more wear per grind, but the total OUTPUT per tool is increased many times. Tool replacement savings alone quickly pay for the machine.

Regardless of OUTSIDE CONTOUR, any kind of reamer or tap, including BENT SHANK TAPS of any size, can be ground faster and more accurately than by hand.

For further details on this revolutionary new grinder send for illustrated folder.

ONE MACHINE... ONE SET-UP ... ONE OPERATION does the entire grinding job QUICKLY and ACCURATELY

CLEVELAND

TOOL ENGINEERING COMPANY

1249 WEST 4TH STREET • CLEVELAND, OHIO

Make 6-Ways Better Welds with EUTECTIC

(Pronounced U-TEC TIC) Reg. U. S. Pat. Off.

Low Temperature

WELDING RODS



EXTRA SMOOTHNESS is demonstrated in this Cast Iron lug built up with EutecRod 18.



UNUSUAL STRENGTH is proved by twist test of Chrome Moly steel tube welded with EutecRod 18.

EUTECTIC welds are: SMOOTHER • STRONGER • BETTER COLOR MATCHED • MORE MACHINABLE • FASTER TO MAKE and REQUIRE LESS HEAT, avoiding distortion, stresses and overheating

No other welding or brazing process affords welders such a combination of advantages at such low bonding temperatures (as low as 340°) and little heat consumption.

Get the facts today! Fill in the coupon or write on your company letterhead for full information.

See EUTECTIC demonstrated at the Metal Show, Cleveland—Booth D-306
National Chemical Exposition, Chicago—Booth 125
National Power Show, New York—Booth 312

Castolin Eutectic

EUTECTIC WELDING ALLOYS COMPANY

Originators of Eutectic *Low Temperature* Welding

40 Worth Street, New York 13, New York. Room 1109 F

Please send me full information about EUTECTIC *Low Temperature* Welding and its many great advantages.

Name_____

Company_____ Position_____

Address_____ City_____



PERFECT COLOR MATCH of the weld was obtained in this Bronze casting built up with EutecRod 10



(Above) EASY MACHINING to a smooth finish is demonstrated on this Cast Iron wheel resurfaced with BRONZOCHROM rod 185

(Below) COPPER TUBE and bronze fitting welded with EutecRod 1800 required no after machining because of smooth fillet formed

THE GRAND RAPIDS NO. 6

UNIVERSAL CUTTER AND TOOL GRINDER



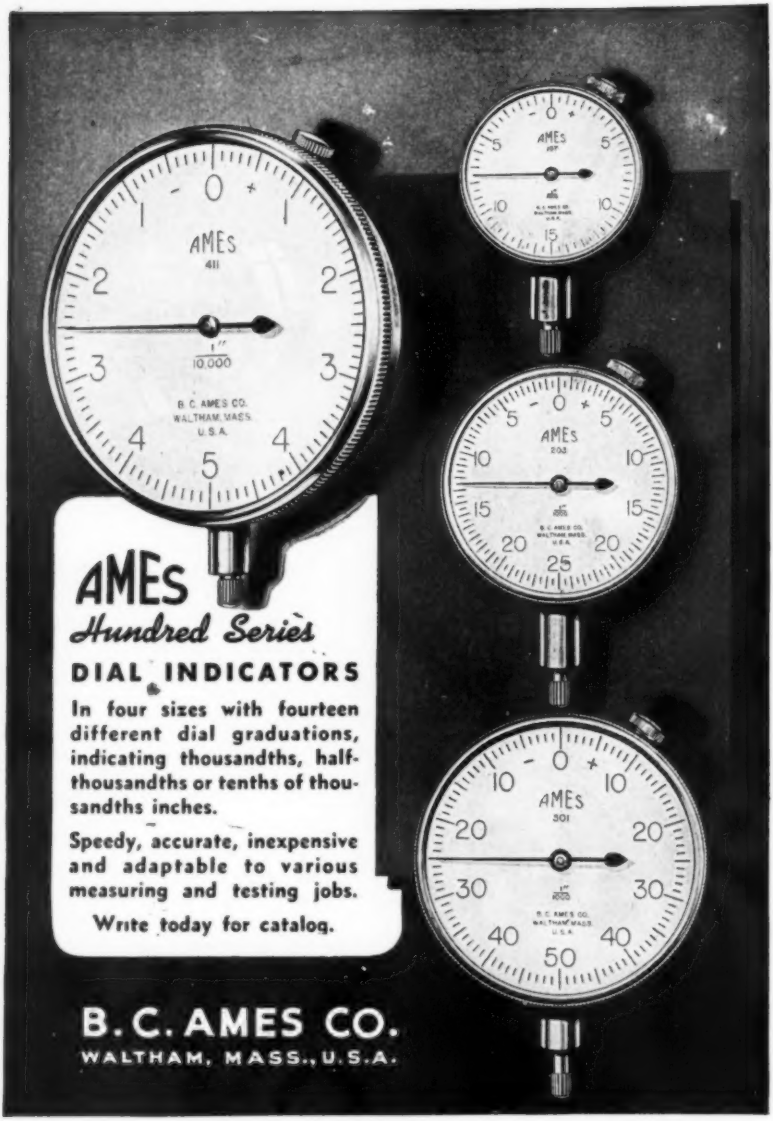
THIS NO. 6 GRINDER FEATURES

- Cabinet Base Construction
- Ball Bearing Table
- Hardened and Ground Ways
- Fixed Table Height
- Cross Movement on Column Enables Operator to Stand Close to His Machine at All Times
- Convenient Location of All Controls
- All Wheel Shafts Mounted on Grease-Sealed Ball Bearings
- Provision for Built-In Dust Collector

THIS MACHINE IS DESCRIBED IN BULLETIN 11-1-41

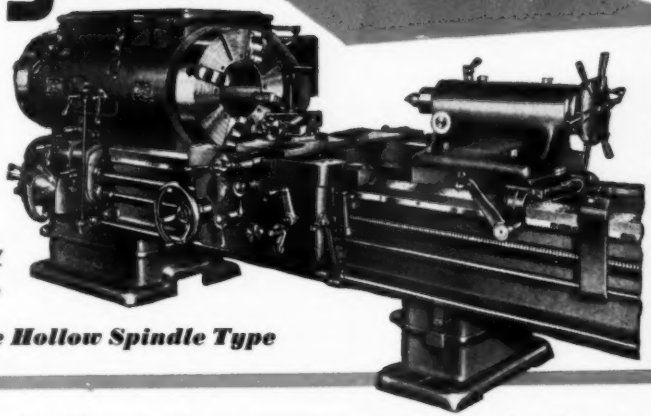
GALLMEYER & LIVINGSTON CO.

405 STRAIGHT AVE., S. W. (4) GRAND RAPIDS, MICH.


AMES
411
B. C. AMES CO.
WALTHAM, MASS.
U.S.A.
AMES
Hundred Series
DIAL INDICATORS
In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.
Speedy, accurate, inexpensive and adaptable to various measuring and testing jobs.
Write today for catalog.
B. C. AMES CO.
WALTHAM, MASS., U.S.A.

Do Important Machining Jobs in 1/2 to 1/7 the Time!

on a Hydratrol Lathe



30" Heavy Duty Lathe with 13" Hole in Spindle

Large Hollow Spindle Type

Yes, in a number of big war plants important operations are being performed in 1/2 to 1/7th the time of previous operations. In one plant, Large Hollow Spindle Type of HYDRATROL LATHES are saving 15,000 man hours per month! Why not let us show you what a HYDRATROL LATHE could do in your plant?

5 SIZES – 18" to 36"

Small . .	18" up to 7¼" Hole	Large	30" up to 14" Hole
Medium	24" up to 12" Hole	Large	36" up to 16½" Hole
Large . .	27" up to 13" Hole	*(Standard Type lathes 16" to 36")*	

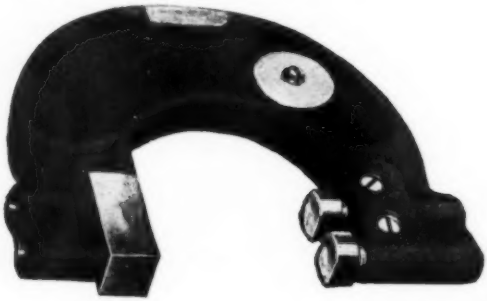
7 Distinctive Features:

- ★ Easy, Fast, Simple Operation.
- ★ Hydraulic Brakes and Clutches.
- ★ Absence of Mechanical Troubles.
- ★ Automatic and Ample Lubrication.
- ★ Mechanism Protected by Automatic Control.
- ★ Extraordinary Hardness of Bed.
- ★ Available with Large Turrets for carriage which fully utilize the Great Power Capacity of these machines; and Beds on both ends of Headstock.

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ ST. LOUIS 3, MISSOURI

ADJUSTABLE LIMIT SNAP GAGES



SIZE	LIST PRICE
.000 to .195	10.40
.195 to .385	10.40
1½ to 1¾	12.50
1¾ to 2	13.50
2 to 2¼	13.50
2½ to 2¾	14.00
2¾ to 3 1/16	15.00
3 7/16 to 3 13/16	16.00
3 13/16 to 4 3/16	16.00
4 3/16 to 4 9/16	17.00
4 9/16 to 4 15/16	17.00
4 15/16 to 5 5/16	19.00
5 5/16 to 5 11/16	19.00
5 11/16 to 6⅛	21.00
6⅛ to 6⅝	21.00

LIST PRICE LESS 25%

IMMEDIATE DELIVERY

Write for Our Catalog and Price List

CENTER TOOL *Machine Shop Equipment* **CO. 153 CENTRE STREET, N.Y.**

We carry a complete line of H.S. Drills, Milling Cutters, Lathe Tools, H.S. & C.S. Taps & Dies, Drill Chucks, Lathe Chucks, Files, Special Taps & Dies



TELEPHONE • LEXINGTON 5380

For precision carbide or hi-speed cutting tools that are setting new standards in performance and service . . . to meet the high production schedules required in modern manufacturing.

ARCHER & SMITH
LIMITED

CARBIDE *Cutting Tools* HI-SPEED

125 N. EASTERN AVENUE LEXINGTON 34, KENTUCKY

WRITE FOR CATALOG • SEND FOR BLUEPRINTS

Sales Representatives:

Opportunities in some territories for the "right" representation. If you feel that you qualify to serve the cutting tool requirements of metalworking industries in your area, please write full details.



ARCHER & SMITH, LTD.,
125 NORTH EASTERN AVE.
LEXINGTON 34, KENTUCKY

Please send latest Cutting Tool Catalog. ☐ Blueprints of special tools we require are enclosed; or ☐ mailed under separate cover.

Name..... Title.....

Firm Name.....

Address.....

City..... State.....



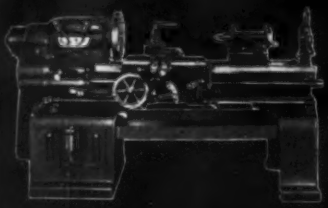
.0005"

Fine accuracies can be secured only through the use of machines built to maintain exacting specifications.

PRECISION IS OUR BUSINESS

For over 57 years Sebastian has built lathes exclusively

"Best Lathe In The Medium Price Field"



SEBASTIAN LATHES

Manufactured by

STOKES INDUSTRIES, *Inc.*

COVINGTON, KENTUCKY

NEW YORK CITY
250 BROADWAY
Tel.: BARCLAY 7-3318

★

WASHINGTON, D. C.
529 UNION TRUST BLDG.
Tel.: DISTRICT 5382

★

CHICAGO, ILLINOIS
561 WEST WASHINGTON BLVD.
Tel.: STATE 3092

PROSSER
Carbide Grinders



These rugged, streamlined grinders are modern in every respect. They are unsurpassed for most rapid rough grinding and finishing of carbides, stellite, high speed steel and other modern tools.

Furnished in bench or floor type, of several capacities, for wet or dry grinding, as desired. Attachments for chip breaker and drill grinding.

MODEL AA

MODEL EE



A FEW SALIENT FEATURES:

- Quick-acting indexing tables.
- Adequate wet-grinding equipment.
- High Grade ball bearing spindles.
- Oversize wheels, giving longer wheel life, and permitting grinding of larger tools. Moderate price.

Prompt Deliveries
Write for Details

THOMAS PROSSER & SON

120 WALL STREET • NEW YORK 5, N. Y.

MACWHYTE WIRE ROPE SLINGS SOLVE INDUSTRY'S HANDLING PROBLEMS

Many different types, sizes, and kinds available

As early as 1912, Macwhyte engineers realized that the great strength and dependability of wire rope made it a perfect material for slings. Since that time they have learned through endless study and research how best to process wire rope into lightweight, easy-to-handle, safe-to-use slings.

Today, industrialists have available a wide selection of Macwhyte sling designs and types, with reliable information as to strengths and safe loads, to assist them in stepping up safety and improving operations.

Take your handling problems to Macwhyte



• (Above) An 80-foot long Macwhyte ATLAS Braided Sling for handling sunken barges. (Right) A pair of Macwhyte ATLAS Braided Slings lifting a 125-ton oil refinery vessel.

Whether you are lifting light or heavy loads, there is a Macwhyte sling to meet your requirements. You will receive prompt, practical cooperation and suggestions based on experience with hundreds of others doing jobs similar to yours.

Send for Macwhyte Sling Catalog S-7. A request on your company letterhead will bring it to you promptly, without obligation.

MACWHYTE COMPANY

2966 Fourteenth Avenue, Kenosha, Wisconsin

Manufacturers of the CORRECT wire rope for your equipment

Left-&-Right Lay Braided Slings, Aircraft Cable, Aircraft Tie-Rods, "Safe-Lock" Swaged Terminals

Mill Depots: New York, Pittsburgh, Chicago Ft. Worth, Portland, Seattle, San Francisco
Distributors throughout the U. S. A.

Manufactured Under U. S. and Foreign Patents.

755A-S

MACWHYTE SLINGS FOR INDUSTRY

"Lifting safety to new heights"

Macwhyte Wire Rope Slings are made to meet the capacity of any crane built.

★ *Buy more War Bonds — hold what you have!* ★

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

A recently patented heating plate has two elements from which four degrees of heat may be obtained by using them singly or in combination as well as in series or parallel.

get ready with CONE for tomorrow

A new patent covers the use of perforated plates at the bow of a small, fast motorboat which permits the hull to ride on a cushion of foam.

get ready with CONE for tomorrow

Spraying the interior of a freight car or truck with dry ice is being tried as an inexpensive method of refrigeration.

get ready with CONE for tomorrow

Serious consideration is being given to the making of illuminating gas near the coal mines and its delivery by pipe line.

get ready with CONE for tomorrow

Cigarette paper, formerly a French monopoly, is now being successfully made in this country.

get ready with CONE for tomorrow

A capsule has been developed that is said to be effective in the prevention of seasickness in about 75% of the cases tested.

get ready with CONE for tomorrow

Cloth is being made from shredded redwood bark mixed with wool.

get ready with CONE for tomorrow

Experiments are being made to determine the suitability of animal blood for human transfusion.

get ready with CONE for tomorrow

Shafts for generators are now being squeezed into shape with dies.

get ready with CONE for tomorrow

A new plant processes 25,000 pounds of milkweed floss per day.

Shoal draft boats with tunnel sterns are made more efficient by the use of a small stand-pipe over the propeller which is kept full of water by a vacuum pump. The propeller is thus constantly surrounded by water although above the water level.

get ready with CONE for tomorrow

Anthropology is not popularly thought of as a commercially useful science, but anthropologists were consulted in designing seats for aircraft, gas masks, and goggles, and they might well be turned loose on the problems of private and public furniture after the war.

get ready with CONE for tomorrow

Airplane propellers are now being made of sponge rubber over a metal core.

Apparatus now in use by our army is expected to make it possible for civilians to forecast weather accurately as much as 24 hours ahead.

get ready with CONE for tomorrow

One of the country's largest chemical companies states that 46% of its gross sales for last year consisted of products unheard of fifteen years ago.

get ready with CONE for tomorrow

Rayon is being used for tire cord, parachutes, paint brushes, pump packing, bullet-proof gas tanks, lint-free gloves, electrical insulation, gas-proof clothing, cartridge bags, felt, and rugs.

get ready with CONE for tomorrow

Optimistic producers of synthetic rubber say that, in the future, people will buy new automobiles to go with their old tires.

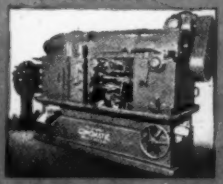
get ready with CONE for tomorrow

Ball bearings are now being made small enough to replace the jewels used in many precision instruments.



Tomorrow's production should eliminate second operations

The 8-Spindle Conomatic produces these wheel hub bolts from SAE 1030 in 34 seconds each. Slot milling in the large diameter and stamping the letter on the end are done without stopping the spindle. Conomatics reduce costs, save time, and eliminate second operations.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.



Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

STURDIMATIC

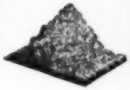
TOOL COMPANY

5224 THIRD AVE. DETROIT, MICH.

WHY TIE UP YOUR SHAPER FOR 5 HOURS?



Shaper grips the work in a vise, the cutting tool shuttles back and forth cutting on only one cycle. Each stroke makes one chip until the entire section removed is reduced to a worthless heap.



DoALL slices out the part to within .005 of the layout line, leaving the section removed in a solid, usable piece.

DO IT ON THE DoALL IN ½ HOUR



DoALL is the contour sawing machine that is doing such a grand job of (both internal and external) metal shaping, saving hundreds of man hours and thousands of pounds of valuable material. Cuts tubing, blocks, bar stock or stacked sheets.

Here's one machine tool that won't require any change-over adjusting when civilian production is given the full go-ahead signal. So, get set now with one or a battery of DoALLS.

Ask for the circular EIGHT DIFFERENT JOBS, illustrating DoALL versatility.



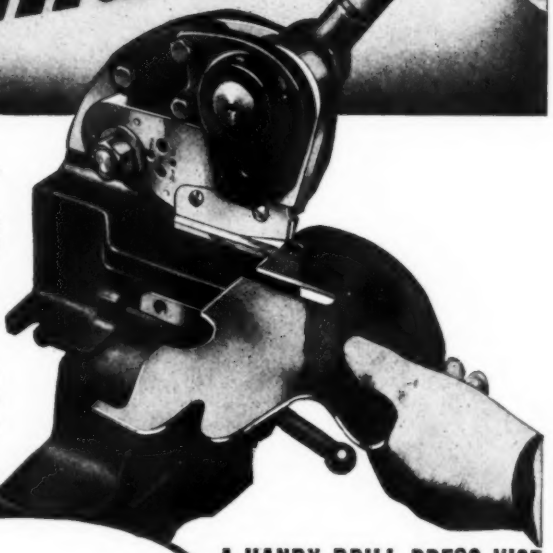
DoALL

INDUSTRY'S NEW SET OF TOOLS

CONTINENTAL MACHINES, INC.

1300 S. Washington Ave. • Minneapolis 4, Minn.

THE HEINRICH Handnib



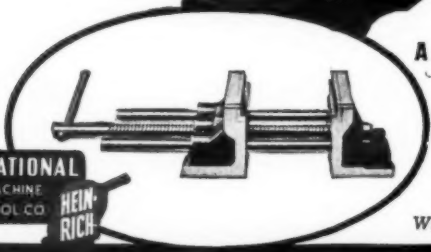
A tool for shearing, nibbling and rod cutting.

Cuts irregular sheet metal shapes quicker and better.

Capacity 3/16" flat stock—3/16, 1/4, 5/16 and 3/8" round stock.

An ideal machine for Toolrooms, Machine Shops — also for Pattern or Experimental Work.

Prompt Delivery



NATIONAL MACHINE TOOL CO. HEINRICH

A HANDY DRILL PRESS VISE

- Built-in Parallels
- No interference from Chips or burrs
- Use it on three sides
- Special V-Groove for round shafts
- Through Drilling without damage to the Vise

WRITE FOR DESCRIPTIVE FOLDERS

THE NATIONAL MACHINE TOOL CO.

1536 CLARK ST., RACINE, WISCONSIN

Today machine shops must be equipped to grind odd-shaped forms. To do this precisely requires dressing the abrasive wheel to the desired contour. No. 41 does that, accurately, quickly.

Introducing No. 41 Contour, Radius and Angle Dresser

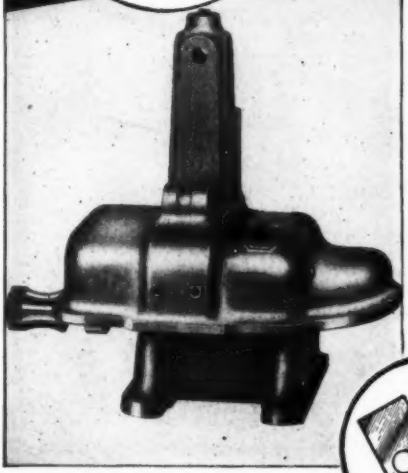
At Last . . . It's Possible!

Now Even the Operator of Limited Experience Can Dress and Re-dress

ABRASIVE WHEELS

Accurately and Quickly to

ANY CONTOUR!



No. 41-B Template Dresser. Rear View.

Plus regular radius and angle Dressing

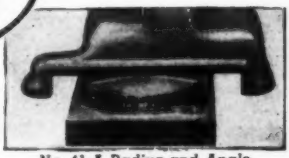
Virtually any desired contour can be generated on abrasive wheels by placing a template of the curve in the clamp of No. 41-B. A spring-activated plunger follows the contour of the template as the operator simply turns the knob. As he turns it, the chisel pointed diamond of the dresser moves across the face of the rotating abrasive wheel, dressing it exactly to the shape of the template.

Flexibility, accessibility of parts for cleaning, and simplicity are among the features of No. 41-A Radius and Angle Dresser made possible by expert engineering design.



After the wheel is dressed by the chisel-pointed diamond, it fits the template accurately. When worn, it is quickly re-dressed to the same contour.

With its base, No. 41-A does all the usual jobs of a quality radius and angle dresser. Yet its cost is remarkably low.



No. 41-A Radius and Angle Dresser. Front View.

Write for Booklet A

SEVERAL TERRITORIES OPEN

BEST TOOLS CORPORATION

ROCKVILLE CENTER, LONG ISLAND, N. Y.

TURRET LATHE OPERATIONS

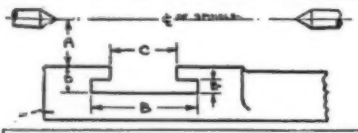


Model 4½-S

on Engine and Bench Lathes with ENCO Turret Tool Posts

Turning, facing, boring, cut-off, threading and forming tools may be mounted in the turret block of your ENCO Turret Tool Post to speed production on your present engine or bench lathe. Fast action, positive indexing brings the next tool into position. Complete job can be set up at once saving valuable lost-time on second operation set-ups. Turret keeps setting accurately. All models mount standard rectangular or square bits as well as standard cut-off blades and boring bars.

"A" Dimension range (from diagram on this page)	Model 6-S	Model 4½-S	Model 3½-S	Model 2½-S	Model H
	2"—3-1/8"	1-9/16"—2-1/2"	1-1/8"—1-3/4"	7/8"—1-5/16"	7/8"—1-5/16"
Lathe Swing	16" swing & up	13" to 16" swing	10" to 13" swing	Bench Lathe	Bench Lathe
Maximum tool bit size	1" or 1-1/4"	3/4" or 5/8"	1/2" Sq.	3/8" Sq.	3/8" Sq.
	1-3/8" toolholder for 3/8" bit (Where no tool bit size is specified, turret will be furnished for 1 inch tool bit)	(Where no tool bit size is specified, turret will be furnished for 5-8 inch tool bit)			
SPECIFICATIONS	4 tool 12 position 6" square Packed in carton Shipping Weight 35 pounds	4 tool 12 position 4" square Packed in carton Shipping Weight 16 pounds	4 tool 12 position 3-1/2" square Packed in carton Shipping Weight 8 pounds	4 tool 12 position 2-1/2" square Packed in carton Shipping Weight 4 pounds	6 tool 12 position 3" Hex Packed in carton Shipping Weight 4 pounds
	Price . $99.00	Price . $49.50	Price . $35.00	Price . $23.00	Price . $25.00



Make of Lathe and Size	A	B	C	D	E	Maximum tool size desired

One-week delivery on ENCO Turret Tool Posts made to specifications. When ordering, furnish all required dimensions and tool size desired and name and address of regular dealer.

- **12 position indexing**
- **3 positions for each tool**
- **Carburized hardened steel construction**
- **Mounts rigidly in compound T-slot**
- **Keeps setting accurately**
- **Indexing is self-contained. Eliminates all chip interference**

IMMEDIATE DELIVERY

on Turrets for these lathes:
Atlas • South Bend • Logan
Sheldon • Clausing

Also all models with machinable base on center post for quick adaption to your lathe.

Better dealers everywhere carry complete stocks of Enco Turret Tool Posts and Enco Tailstock Turrets. However, if your dealer does not carry them, send your order and specifications direct to the Chicago or New York offices listed below, supplying name of regular dealer through whom orders can be billed.

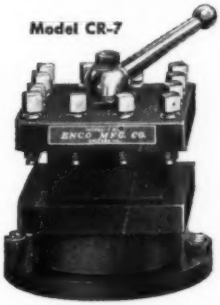
ENCO MANUFACTURING COMPANY, Dept. 23

General Office and Factory:
4522-24 FULLERTON AVE., CHICAGO 39, ILL.

Eastern Sales Office:
129 CROSBY ST., NEW YORK 12, N. Y.

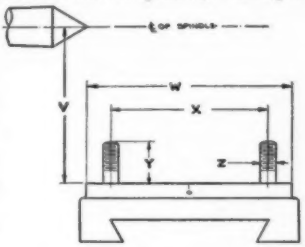
NEW ENCO CR-MODEL REPLACES the COMPOUND

Model CR-7



. . . FOR GREATER RIGIDITY AND HIGHER ACCURACY

ENCO's new *compound replacement* model gives you the utmost in tool rigidity under high speed production and removes a possible source of chatter and inaccuracy in the compound. Designed especially for engine and bench lathes with low center heights—(the height from the top of the compound rest to center line of spindle). Clamped rigidly on the bolt circle the CR Turret mounts maximum tools and tool holders as shown below. Range of lathe swings covered is from 9" to 36".



The turret block has 12 indexing positions spaced 30° apart enabling each of the 4 tools mounted in the block to perform more than one operation. A facing tool, for example, may be used for turning by indexing the same tool to next position. This flexibility in use means that standard ground tools, including **angular** tools, may be used without special re-grinding.

Turrets are shipped complete and ready for use and no further machining is necessary.

When ordering please furnish all required dimensions shown on the chart.

LATHE SPECIFICATIONS						
MAKE OF LATHE AND SIZE	V	W	X	Y	Z	TOOLHOLDER OR TOOL SIZE DESIRED

MODEL	CR-7	CR-6	CR-4½	CR-3½
MAXIMUM TOOL SIZE	Up to 1¾" tool or No. 4 Tool holder for ½" sq. bit	Up to 1¼" tool or No. 2 Tool holder for ⅜" sq. bit	Up to ¾" tool or ⅜"x¾" Tool holder for ¼" sq. bit	Up to ½" Tool
SUGGESTED LATHE SWING	22" to 36"	16" to 24"	13" to 17"	9" to 14"
SIZE OF TURRET BLOCK	4¼" thick 6½" sq.	3" thick 6" square	2¼" thick 4½" sq.	1¾" thick 3½" sq.
SPECIFICATIONS	4 Tool 12 position packed in crate. Shipping Wt. 80 lb. **Price $160.00**	4 Tool 12 position packed in crate Shipping Wt. 50 lb. **Price $129.00**	4 Tool 12 position packed in crate. Shipping Wt. 25 lb. **Price $79.50**	4 Tool 12 position packed in carton. Shipping Wt. 12 lb. **Price $55.00**

DELIVERY ONLY 5 DAYS AFTER ORDER IS RECEIVED

ENCO MANUFACTURING COMPANY, Dept. 23

General Office and Factory:
4522-24 FULLERTON AVE., CHICAGO 39, ILL.

Eastern Sales Office: (Complete stocks carried)
129 CROSBY ST., NEW YORK 12, N. Y.

Typical Jobs



Drawing and Blanking Die "Saves time in producing smooth base metal finish."



Compressor Yoke. Alignment maintained and better finish produced.



Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.



Bearing. A very small part. 2 micro-inch finish necessary.



Shell Loading Die.



Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



Cast Iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.



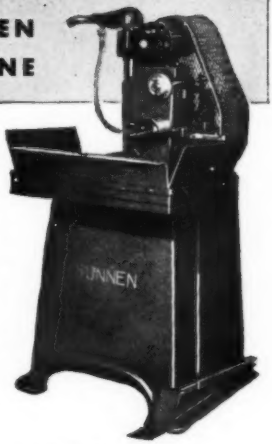
Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.



Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

PARTS LAST LONGER

When Honed on the SUNNEN PRECISION HONING MACHINE



Time after time, users of the Sunnen Precision Honing Machine have shown that they get longer service and have fewer repairs than by any previous method of internal finishing.

There's a good reason for these results, too. This machine has an amazing record for accuracy. Straight, round holes are produced with a guaranteed accuracy of .0001". Accuracy has been held to .000025" on hardened steel jobs. A super-smooth finish of from 2 to 3 micro-inches provides a better working surface.

A new base and pump assembly, recently introduced, has improved results still further. The pumping unit provides a constant flow of honing fluid that acts as a coolant, carries away cuttings, and keeps the abrasive stone in sharp cutting condition.

There are many other reasons why the low-cost Sunnen Precision Honing Machine will give you a finish that makes parts last longer. Get complete information by calling a Sunnen engineer to your plant—or write for free bulletin.

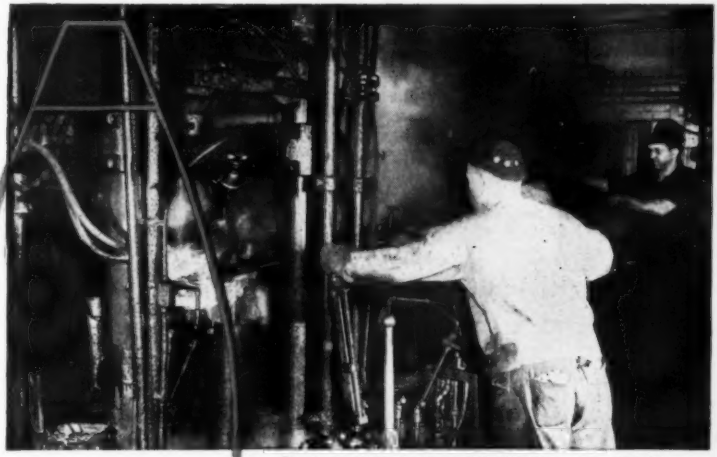


The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.

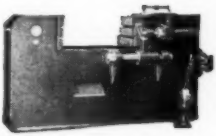
SUNNEN

SUNNEN PRODUCTS COMPANY · 7935 Manchester Avenue · St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario



Piercing and shaping heated steel billets on one of the Elmes 500-ton hydraulic piercing presses at Willys-Overland.



Elmes hydraulic presses remove heating scale before piercing.



Elmes hydraulic draw benches size and elongate shell blanks.



Elmes high-pressure pumps and an Elmes accumulator system operate all hydraulic units.

BORN FOR BATTLE by a *Punch in the Nose!*

Millions of 155-mm. high-explosive shells have taken form on Elmes hydraulic equipment. At Willys-Overland, where several duplicate shell-production lines run day and night, Elmes presses and hydraulic draw benches are providing the "punch in the nose" that starts these powerful projectiles on their way to fighting fronts.

Heated steel billets are descaled on Elmes descaling presses, then pierced for nearly their full length on Elmes 500-ton vertical piercing presses, and, finally, sized and elongated on Elmes mandrel-type draw benches into rough shell blanks, 6.4″ in diameter, 28″ long, and with a 4⅞″-diameter cavity, 25″ deep, pierced so accurately that no internal machining is needed.

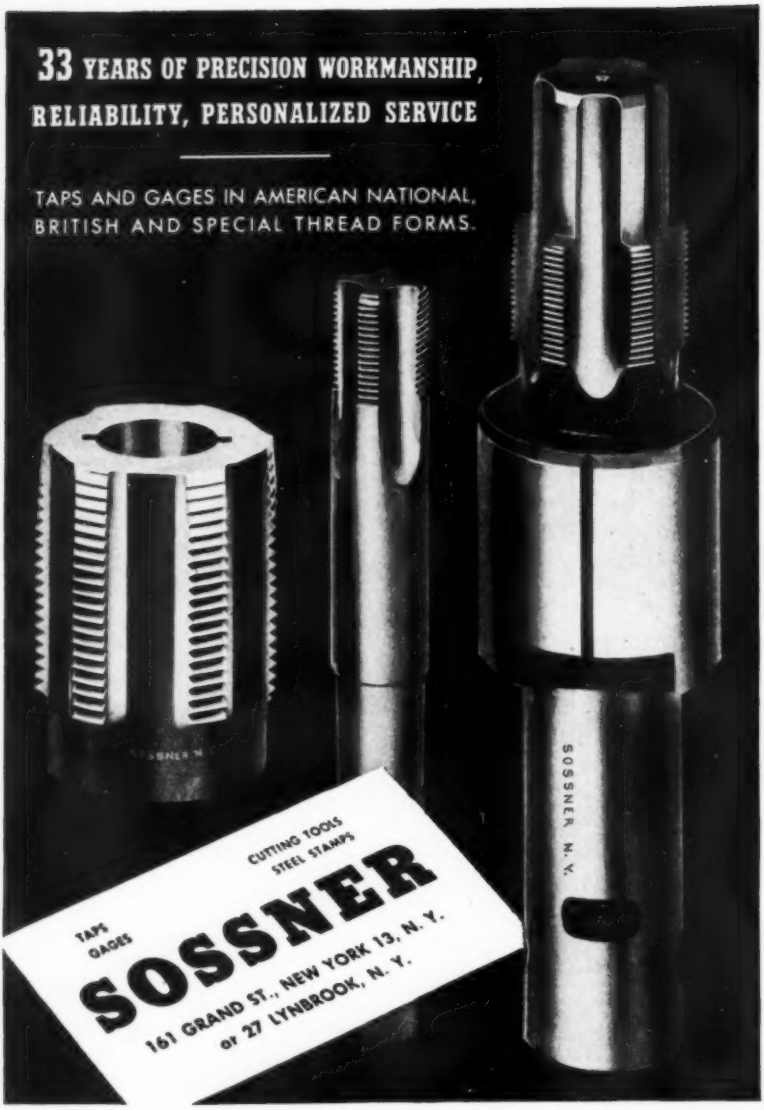
You too can put your pressing problems up to Elmes. Elmes Engineering Works of American Steel Foundries, 244 N. Morgan St., Chicago 7.

ELMES HYDRAULIC EQUIPMENT

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

33 YEARS OF PRECISION WORKMANSHIP, RELIABILITY, PERSONALIZED SERVICE

TAPS AND GAGES IN AMERICAN NATIONAL, BRITISH AND SPECIAL THREAD FORMS.



CUTTING TOOLS
STEEL STAMPS
TAPS
GAGES

SOSSNER

161 GRAND ST., NEW YORK 13, N. Y.
or 27 LYNBROOK, N. Y.



HOW TO CONVERT A HAND-OPERATED DRILL PRESS TO AN AUTOMATIC PRODUCTION UNIT IN 10 MINUTES

See IT OPERATE
Booth D-311
NATIONAL METAL SHOW

A BELLOWS Controlled Air-Power Drill Press Feed, synchronized with a Bellows Controlled-Air Vise, brings automatic production to standard drill presses in a matter of minutes.

The Bellows Feed, at the touch of a handle, advances the tool through the work at a precise and exactly controlled rate. The Bellows Air Vise, or a custom-made fixture operated by a Bellows Air Motor, opens and closes automatically with the movement of the spindle. All the operator has to do: *Insert the work — push the handle.*

Bellows Controlled Air-Power Devices can quickly convert hand-operated drill presses, millers, grinders, and other machine tools to automatic production units. Not only is production increased by the automatic action, but the reduction in operator physical effort means less fatigue, less shop accident hazard, more uniform quantity and quality of production.

SEND FOR NEW, FREE PHOTO-FACTS FILE — Twenty-five photographs showing interesting applications of Bellows Controlled Air-Power Devices in leading plants all over America — together with a record of production accomplishments, installation costs. Send for your free copy, today.

The Bellows Co.

861 E. TALLMADGE AVE., AKRON 10, OHIO

CIRCLE "R" METAL CUTTING SAWS

NO WONDER THEY'RE GOOD

This company has been making circular metal cutting saws since 1923, when it was founded, and all its officers and employees were experienced saw makers for a long time before that. Almost all of our factory space, 20,000 square feet, is devoted to this one product.

So it is a fair assumption that we "know" circular saws. In fact we *have* to, because our reputation depends chiefly on this one product. No wonder circle "R" saws are good!

Have you tried them? If not, send for our Catalog K.



PRECISION CONTROL

of manufacturing is another reason why Circle "R" saws are good. Our modern heat treating ovens have potentiometric control, — the most accurate method for the purpose.

® CIRCULAR TOOL CO., Inc. ®

PROVIDENCE 5, R. I.

CHICAGO · PHILADELPHIA · NEW YORK · DAYTON · CLEVELAND
LOS ANGELES · ROCHESTER · INDIANAPOLIS · DETROIT · ST LOUIS

CHICAGO

STEEL PRESS BRAKES—HAND AND POWER BENDING BRAKES—AND DIES FOR ALL STANDARD MODERN PRESS BRAKES



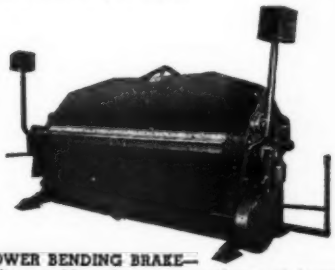
BOX AND PAN BRAKE—
Forms boxes or pans from one piece of metal. A straight brake as well as a box brake. Ideal for experimental shops.

All Chicago Brakes are built of rolled steel welded sections which insures great strength, accuracy and long life.

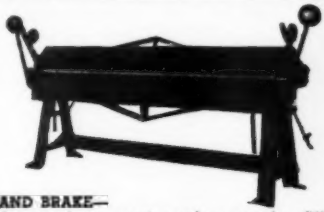
Up to the minute in design and workmanship, they fit the present need for fast production sheet metal working machinery.

We also build special machines for intricate bending operations.

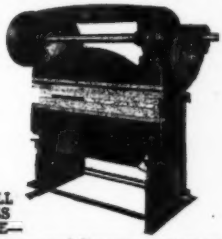
Take advantage of our experience of over 40 years by sending to us any difficult bending problem you have.



POWER BENDING BRAKE—
Indispensable wherever a volume of heavy plate work is done—forms a great variety of bends and shapes without dies.



HAND BRAKE—
Improved to meet modern needs. Efficient and dependable—sturdy and durable.



SMALL PRESS BRAKE—
Compact, powerful money-saving production unit. Replaces cumbersome costly machines that are expensive to operate. Uses same dies as larger machines.



LARGE PRESS BRAKE—
The only press brake which turns out perfect work without shims and crowned dies. Patented non-deflecting bed equalizes pressure over the full bending length and overcomes major fault in solid bed press brakes.

DREIS & KRUMP MANUFACTURING CO.

7440 LOOMIS BLVD., - - - CHICAGO, ILL.

SEND FOR NEW BOOK "FORMING PRESS DIES AND THEIR USES"

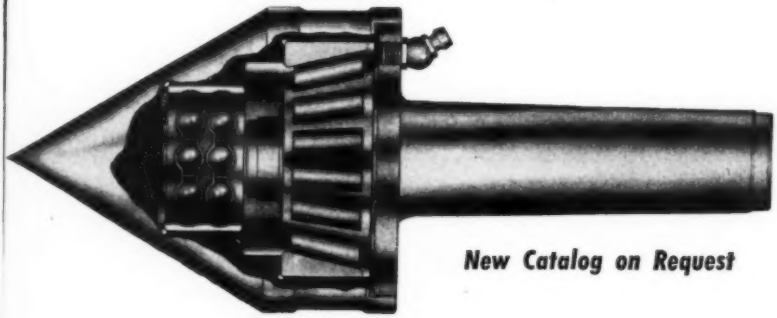
MARVECO

EISENHOWER & WASHINGTON

What would be the outcome if Gen. Ike Eisenhower had to depend on the tools of war used by Gen. Geo. Washington?

What will be the outcome if you depend on obsolete tools and equipment in the battle for survival in postwar business?

Have you tried your Marveco yet?



New Catalog on Request

THE MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.

SEND US YOUR CENTER PROBLEMS

MARVEL TOOL & MACHINE COMPANY

Exclusive Manufacturers of MARVECO . . . The Live Center

10977 W. JEFFERSON AVE., RIVER ROUGE 18, MICHIGAN



These tools of

MO-MAX

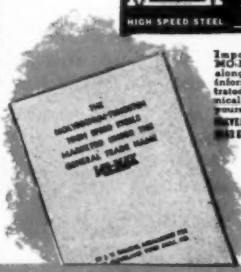
HIGH SPEED STEEL

have 154,999,999 brothers!

MO-MAX tool totals run into "box-car figures". For example, one tool maker alone has turned out no less than 155 million cutting tools of MO-MAX. From this you can judge the wide acceptance now enjoyed by the first commercially available molybdenum high speed steel, a steel that has proved its leadership in ten years of test and performance.

MO-MAX has superior cutting quality. It is a happy combination of great toughness and high hardness. Its basic composition is long established and obtainable from any sources. Special varieties, such as the cobalt types and hot die steel have been developed, and are available to those who need them.

MO-MAX HIGH SPEED STEEL — YEAR AFTER YEAR *One Uniform Standard*

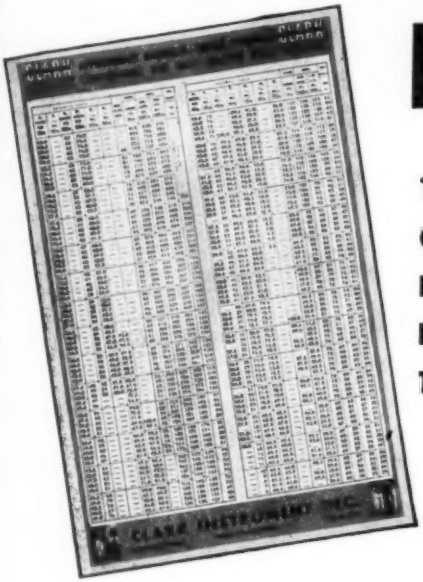


Important facts about MO-MAX are presented, along with other useful information, in an illustrated, chart-packed technical data book which is yours for the asking.

CLEVELAND TWIST DRILL CO., 3242 E. 49th St., Cleveland 14, O.

THEY'RE ALL MO-MAX

"LMW" . . . . . Allegheny Ludlum Steel Corp.	"Moltie F" . . . . Columbia Tool Steel Company	"Tatmo" . . . . . Latrobe Electric Steel Co.
"Mohican" . . . . Atlas Steels, Ltd.	"Rex-T-Mo" . . . Crucible Steel Co. of America	"S. T. M." . . . . Simonds Saw and Steel Co.
"Bethlehem HM" Bethlehem Steel Company	"Di-Mol" . . . . . Henry Disston & Sons, Inc.	"Mo-Tung" . . . Universal-Cyclops Steel Corp.
"Mo-Cut" . . . . Braeburn Alloy Steel Corp.	"Rex-T-Mo" . . . Halcomb Steel Co.	"V-M-S" . . . . . Vanadium-Alloys Steel Co.
"Star Max" . . . The Carpenter Steel Co.	"Mogul" . . . . . Jessop Steel Company	"Vul-Mo" . . . . Vulcan Crucible Steel Co.



FREE!

THIS 24″ x 32″ WALL CHART GIVES ROCKWELL BRINELL, SCLERO, VICKERS HARDNESS AND TENSILE STRENGTH CONVERSIONS

●

• If you are a production executive whose responsibility includes the hardness testing of metals, you will certainly want one of these new charts for your office, shop, or laboratory. Handsome in appearance, printed in three colors, with the very minimum of advertising, it will prove its value every hour of every day. Type is large, easily read at a distance of several feet, yet the chart itself is only 24″ wide and 32″ high — about the size of a calendar.

Although a chart like this is relatively expensive to produce, and the quantity is rigidly limited, a copy is yours — free for the asking — if you request it on your letterhead. Write Dept. MT, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Michigan.

CLARK

TOMORROW'S ACCURACY TODAY

HARDNESS TESTER



Versatile! THE No. 33 U. S. MULTI SLIDE . . . high-production Machine for automatic forming - piercing - cutting - trimming - embossing - swaging.

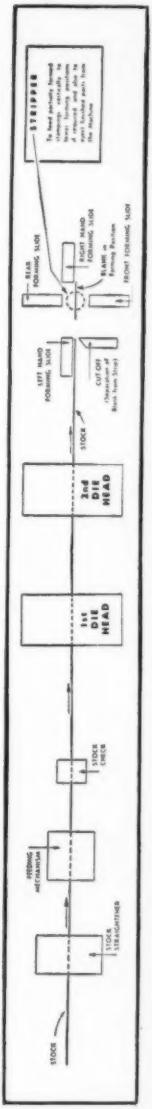
The schematic drawing (top view of machine) indicates the methods used for processing parts from coil stock in the U. S. Multi Slide Machines; the operations produce complete metal stampings without the need for subsequent handling. The drawing indicates the use of two die heads and a cut-off slide. However, many parts can be produced with only one die head and without the cut-off slide.

The additional die heads may be applied to piercing, trimming, embossing and swaging operations, the timing of the die heads being staggered to distribute the load. The U. S. No. 33 Multi Slide is designed to accommodate one, two or three die heads as determined by the design of the part.

Complicated parts usually requiring additional operations can be completed in Multi Slide Machines, as the forming can be handled on one, two or three levels, depending upon the nature of the work. The stripper mechanism is applied to the removal of completed parts from the Machine and to the transfer of partially formed blanks to lower level positions for final forming.

Illustrated at the left are some typical parts handled to advantage with speed, accuracy and economy on U. S. Multi Slides. Bulletin No. 15 contains complete descriptive and specification data for all U. S. Multi Slide Machines. Write for your copy — and engineering recommendations — today.

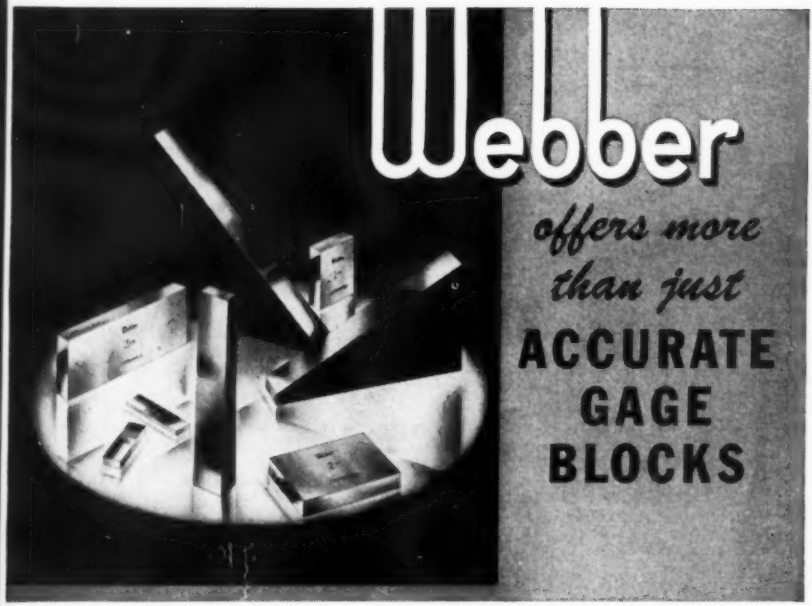




U. S. TOOL COMPANY, INC.

Ampere (East Orange), N. J.

BUILDERS OF THE U. S. MULTI SLIDES — U. S. MULTI MILLERS — U. S. AUTOMATIC PRESS ROOM EQUIPMENT —U. S. DIE SETS AND ACCESSORIES



Investigate Webber Service after the Sale!

• Dimensional Accuracy—Stability—Surface Finish—Wearing Quality are inherent qualities of all Webber Gage Blocks. They are the result of years of research—long experience in making precision gage blocks—the combination of modern methods of production under ideal conditions—and the exclusive manufacture of precision gage blocks.

Thus Webber assures dependably accurate measurements on every step of your production from tool room to assembly. But Webber service doesn't stop here. It provides complete facilities for inspection—and replacing worn or damaged blocks at a moderate cost.

The Webber 84-A Set of gage blocks contains two .100" wear blocks and one .10005" block in addition to the regular blocks in the set. This adds immeasurably to the life of the set and makes possible about double the number of measurements of the average set.

Webber service also includes an Angle Gage Set permitting the accurate measurement of 370,800 angles up to ¼ second of an arc—easily and quickly.

Webber Gage Sets are furnished as follows—

Set No. 84A—$350.00 Set No. 84B—$235.00
Set No. 43A—$185.00 Set No. 43B—$150.00
Set No. 38A—(Thin Blocks) $195.00
Set No. 38B—(Thin Blocks) $155.00
Set No. 14A—(Angle Blocks) $450.00



TOP FLIGHT PERFORMANCE!



Whatever the grinding purpose may be, ABRASIVE COMPANY GRINDING WHEELS deliver Top Flight Performance. If you're looking for *improved* results in uniformity, economy and longer wheel life . . . if your job, or jobs, are listed below . . . then we cordially invite you to investigate ABRASIVE COMPANY PRODUCTS. Write for FREE Data Book—120 pages of interesting information on modern grinding.

Wheels, Discs, Segments, Grain, Mounted Points for

Internal Grinding	Cylindrical Grinding	Surfacing
Tool and Cutter Grinding	Roll Grinding	Snagging
Centerless Grinding	General Purpose Grinding	Cutting-Off

COMMANDING QUALITY . . . OUTSTANDING RESULTS!

ABRASIVE COMPANY

DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS., PHILADELPHIA, PA. • DISTRIBUTORS IN ALL PRINCIPAL CITIES

PRECISION SPEED CONTROL

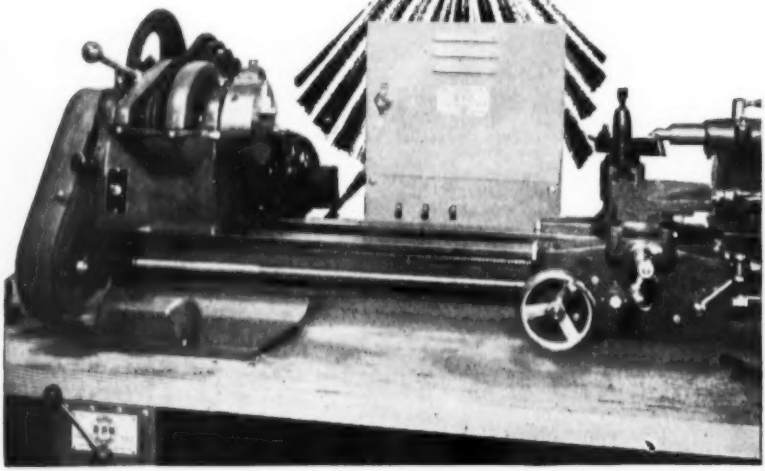
for

D. C. MOTORS ON A. C. LINES

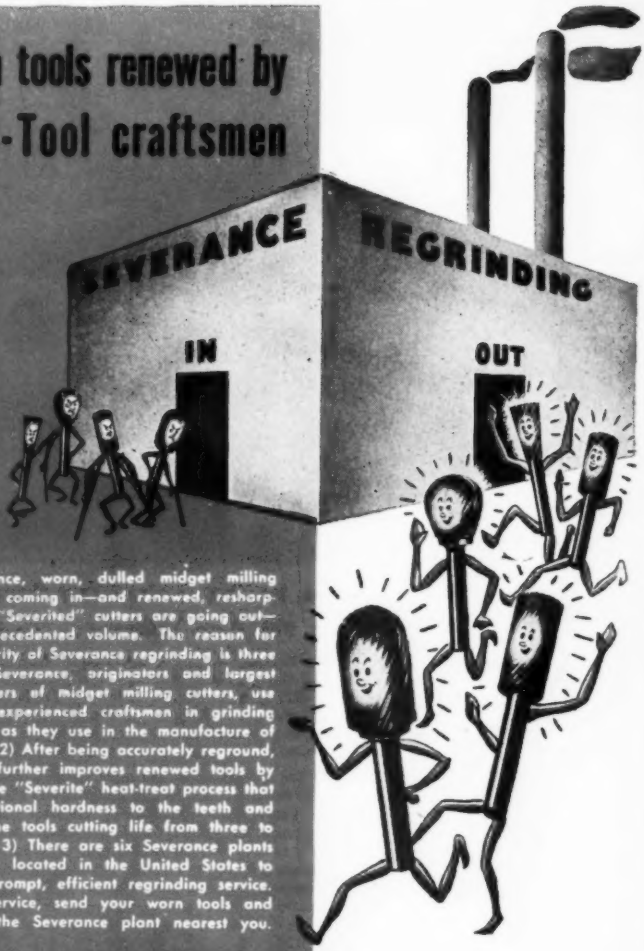
The Varitronic Drive gives speed ratios as high as 100 to 1, all stepless. Efficiencies as high as 95% are achieved constantly by Varitronic Drives now in various applications. The performance of this outstanding electronic motor control unit is incomparable. It offers remote control, fast reversing, plugging and inching all from one lever, if desired. No moving parts, no vibration. Soundless operation. Average life span of Varitronic Drives is not yet determined. First installations made in 1926 still in perfect operation. Where multi-speed motor control is required Varitronic Drives give matchless service, longer life, higher efficiency. Available for D.C. motors up to 500 H.P. on 3 phase A.C. lines. *Write or wire for complete facts, free literature.*

ELECTRON EQUIPMENT CORP.
917 MERIDIAN AVE.
SOUTH PASADENA, CALIFORNIA

VARITRONIC
Electronic
MOTOR DRIVE



Worn tools renewed by New-Tool craftsmen



At Severance, worn, dulled midget milling cutters are coming in—and renewed, resharpened and "Severited" cutters are going out—in an unprecedented volume. The reason for the popularity of Severance regrinding is three fold: 1) Severance, originators and largest manufacturers of midget milling cutters, use the same experienced craftsmen in grinding worn tools as they use in the manufacture of new tools. 2) After being accurately reground, Severance further improves renewed tools by the exclusive "Severite" heat-treat process that gives additional hardness to the teeth and increases the tools cutting life from three to five times. 3) There are six Severance plants strategically located in the United States to give you prompt, efficient regrinding service. For best service, send your worn tools and cutters to the Severance plant nearest you.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • Severance Tool Industries Inc., Saginaw, Michigan • Plants in Long Island City 1, New York; Detroit 2, Michigan; Fort Wayne 8, Indiana; Chicago 6, Illinois and Los Angeles 21, Cal. In Canada: 60 Front St., W., Toronto, Ont.



Here go some more of those exceptionally good Wade Lathes to speed up Precision Production

You, too, Can Increase Your Output and Get Greater Accuracy with Wade Toolmakers' Precision Lathes

THE Wade Model 8-A Toolmakers' Precision Lathe is the choice of so many manufacturers because it helps speed up production by enabling men to work faster, with greater accuracy and with less spoilage. Operators can get a larger daily output because all control and operating features are carefully worked out for efficient handling of the work.

You can get faster and more accurate production on this lathe because it is carefully designed and built with features that give it extreme accuracy for precision work. These close tolerances are possible: Thread cutting operations: Overall error in lead will not exceed plus or minus .0005" per foot. General turning operations: Accuracy within .0003" over a distance of any one foot. Facing: Will check within .0002" concave and .0000" convex on an 8" face. You can depend on Wade Precision Lathes for precision, versatility and stamina.

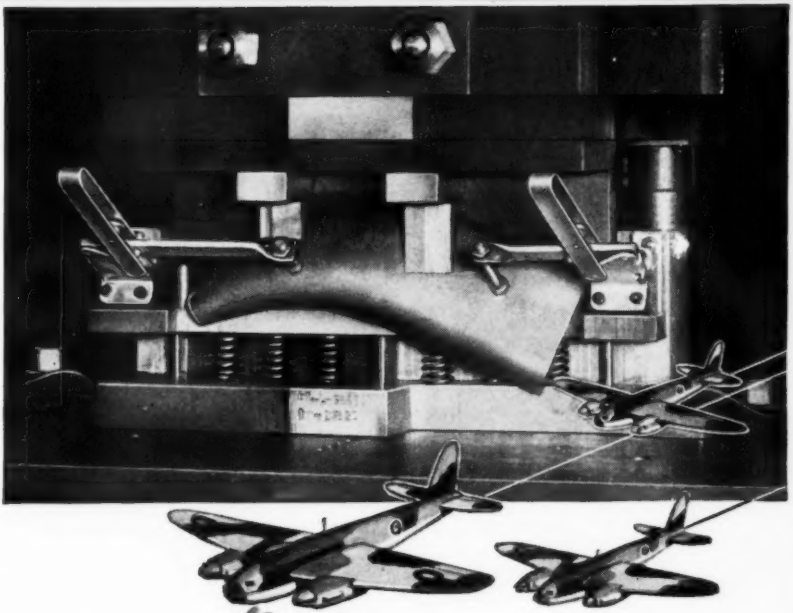
Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

Write today for catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS



Target Berlin

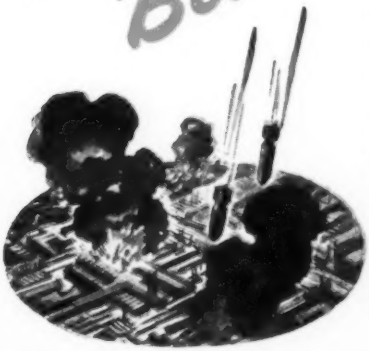
Danly Die Set

Die Springs	Stripper Bolts
Dowel Pins	Goose Neck Clamps
Kwik Klamps	Knurled Cap Screws

Are all in this picture, Target Berlin!

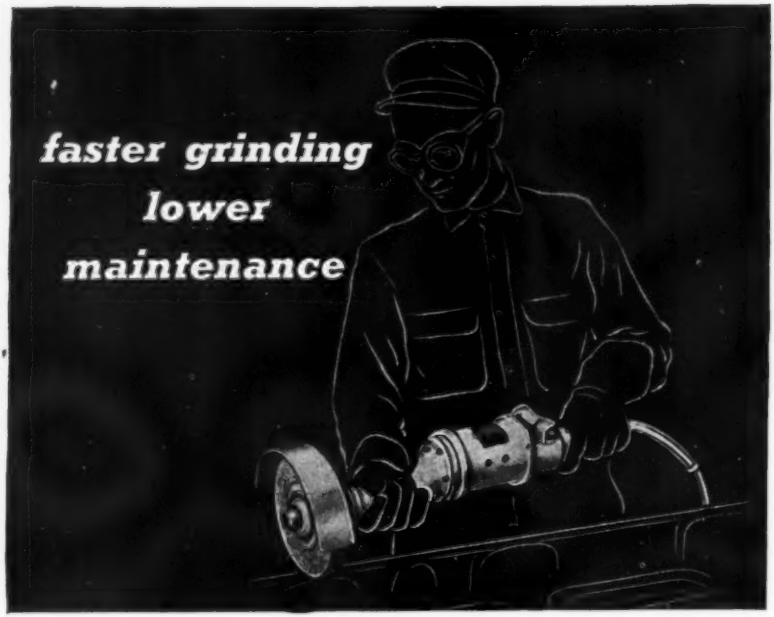
The famous British "Mosquito" bomber, that keeps Berlin awake on "quiet" nights, carries many parts made in Danly Die Sets.

Shown above is one of 8 dies that form and trim the exhaust pipes of this World's Fastest Bomber. Also shown is an interesting example of Danly Die Makers' Supplies, assembled with the die in a Danly Die Set. Easy for the die maker, tough on the Axis.



DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue *Chicago 50, Illinois*

Danly Die Sets - Die Makers' Supplies



CP HICYCLE ELECTRIC GRINDERS

CP Hicycle Electric Grinders with their high sustained speed, light weight and perfect balance not only remove more metal in less time but also materially lengthen the life of the grinding wheels. Plant records show that CP Hicycle Electric Tools have the lowest maintenance costs of any type of portable tools. For complete information write for Catalog 900.

The CP line of Hicycle Portable Electric Tools includes Grinders, Sanders, Buffers and Polishers, Drills, Reamers, Screw Drivers, Nut Runners, Stud Setters, Tappers, Radial Arms, Accessories.

PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Performance



The outstanding performance of the WOODWORTH LIMITROL Comparator Gage has proved its superiority over other gaging methods. LIMITROL checks errors involving pitch diameter, lead, taper, angle, out-of-roundness and straightness. It eliminates "feel," reduces scrap, and cuts inspection costs by combining greater speed with greater accuracy. Write for LIMITROL catalog No. 44-L.

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD · DETROIT 20, MICHIGAN

PRECISION GAGES · PRECISION MACHINED PARTS · HEAT TREATING · PLATING

WITHOUT QUALIFICATION, NORBIDE TIPPED ROYAL PURPLE* PLUG AND RING GAGES ARE MORE ACCURATE OVER A LONGER PERIOD—AND THEREFORE MORE ECONOMICAL THAN ANY OTHER GAGES OF THIS TYPE...



Norbide (boron carbide) approaches the diamond in hardness—yet this is but one reason for its outstanding qualities when used to tip plug and ring gages and other wear parts. Another reason is the fact that this material is non-metallic and therefore cannot charge. It cannot pick up lint, dust or metal particles that might scratch and scrap valuable parts.

Reports like this indicate user's enthusiasm—"measuring cost was 1/11th that of H. S. S." . . . . "275,000 holes plugged without showing measurable wear" . . . . "gage wore only .0001" after measuring 670,000 holes" . . . . "gaged over 500,000 grinding wheel holes—H. S. S. gages wore out after 3,000 holes."

A test of this perfect tipping material will convince you that the New England Royal Purple line of gages, contact points, anvils, etc. offers one of the most economical steps that can be taken by any inspection department.

*Royal Purple color is used on the steel shanks of all New England boron carbide products for quick identification.

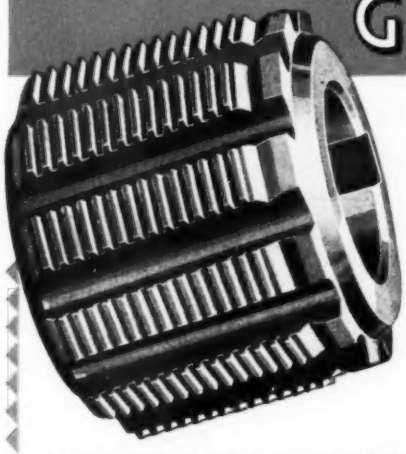
Norbide—Trademark of Norton Co. Reg. U. S. Patent Office.

NEW ENGLAND CARBIDE TOOL CO., Inc.

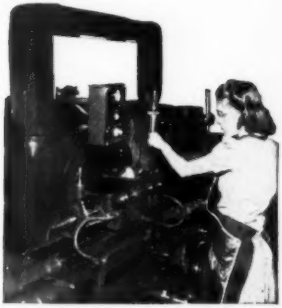
40 BROOKLINE ST., CAMBRIDGE 39, MASSACHUSETTS

SPECIALISTS IN

THREAD GRINDING



With an engineering staff experienced in solving thread grinding production problems, and a large quantity of the most versatile grinders, we are able to satisfy the most exacting requirements. Your prints will receive prompt attention and our quotation and delivery will prove most satisfactory.



- **Multiple Thread Mills**
  Any size to 8x12
- **Thread Gages**
  Any size to 6" plug, 5" ring
- **Hobs**
  Any size to 8x12
- **Production**
  Any size to 3" thread length, 6" O.D.

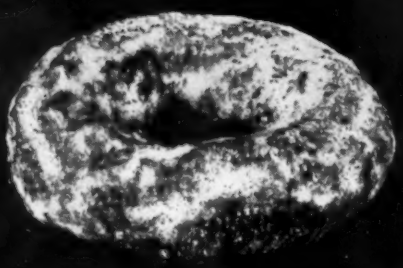
← ARROW →

METAL PRODUCTS CO.

9325 E. Forest Ave., Detroit 13, Michigan

DIES • FIXTURES • GAGES
FORM TOOLS • REAMERS • CUTTERS

NORTON ABRASIVES



More Doughnuts from "METALITE" Cloth Belts

No! THEY DIDN'T USE THESE SANDING BELTS ON THE DOUGHNUTS; but they made it possible to turn out more doughnuts through the production of more machines in less time. Glance at just two examples:

"52 pieces—'A' Pipe posts. These had to be ground on the top to fit jig, as well as on the diameter for plating. It would have required 17 face wheels for this job. The material was extra tough. Only one #40 grit belt was used.

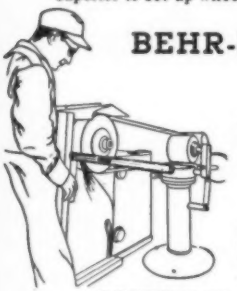
3 pieces—D 1099 Doughcan Covers. #46 grit stone wheel, 12½ minutes; #80 grit face wheel, 7½ minutes. 20 minutes to prepare for plating; 5 minutes to rehead wheel. Total time 25 minutes (8⅓ minutes per piece).

12 pieces—D 1099 Doughcan Covers were ground using the Belt Method. These castings had heavy gates on them which had to be removed. Total time 37½ minutes (3⅛ minutes per piece)."

An Idler Backstand—and there are several fine makes—equipped with these outstanding abrasive cloth belts designed for this specific purpose, is not only far superior to set-up wheels, but can be adapted to purposes entirely new.

BEHR-MANNING · TROY, N.Y.

(DIVISION OF NORTON COMPANY)

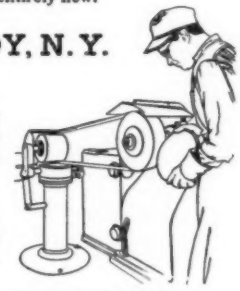


THE PIPE POST JOB

One of our able and practical men will gladly counsel both on machines (which we do not sell) and Metalite Cloth Backstand Belts (which we do).

•

A few lines on your letterhead will bring prompt service with no obligation. That's how Doughnut Corporation, Ellicott City, Maryland, got started.



DOUGHCAN COVER JOB



DISTRIBUTOR TERRITORIES OPEN — WRITE FOR DETAILS!



A new lathe attachment incorporating steady rest and quick change tool holder in one piece ready to install in the tool post to help you to do turning, threading, forming and cutoff work faster with less tool breakage and work scrap. You can have as many instant tool changes as you like without losing setup.

Put a piece of ⅛" drill rod in the collet of your lathe, allowing it to project about 18", turn a piece on the end down to 1/32" diameter 1" long, then cut it off leaving a head about ⅛" long. Can you do it? We can in less than five minutes. We can do a lot of other remarkable things with the MICRO-TURNTHREAD too. Get one in your shop on trial. Capacity of ⅛" to 2" available.

MANUFACTURED AND DISTRIBUTED BY

BLANK and BUXTON
MACHINERY COMPANY

3100 E. MICHIGAN AVE. **JACKSON, MICH.**



Chuck never did stop "scouting" —for you

IN civilian life Chuck worked hard for your Industrial Supply Distributor. Perhaps you didn't know it then—but many a time it was his hard, persistent scouting for scarce materials and supplies that helped you to keep your production going.

Then Chuck put on the Uniform—but he never did stop scouting for you. Today he is up there in the sky, but when it's over he will be back with your Industrial Supply Distributor—with new ideas for helping you still more.

Give your Distributor every opportunity to help you. Particularly nowadays, channel every order you possibly can through him instead of sending direct to the factory. Twenty orders to the Distributor can be cleared in *one* order to the factory—will be delivered in most cases from stock with less paper work and less congestion on overcrowded rail and trucking facilities.

For your own and *everybody's* benefit—

Telephone your FIRST!

ARMY NAVY

ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

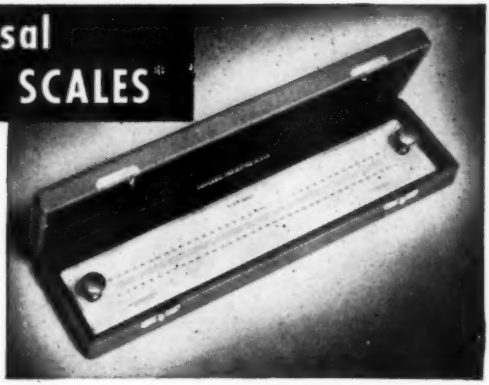
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 BEARDSLEY ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6615 SECOND BLVD. DETROIT · LONDON - E. P. BARRUS, LTD. - 37-39 UPPER THAMES ST. E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

Universal PROJECTOR SCALES*

. . . Eliminate Computations on your Comparator Measurements



Since their introduction a short time ago Universal Projector Scales have had a universal acceptance for contact measurements on the viewing screens of Optical Projectors and Comparators. Accurately ruled on the under side of selected plate glass, they can be brought into intimate contact with the image and easily read by transmitted or reflected light. The six magnifications available—10X, 20X, 25X, 31.25X, 50X and 62.50X—make direct reading of measurements possible in one-half thousandth to two one-thousandths of an inch, depending on magnification.

Universal Projector Scales can be used for

1. Measuring contour drawings before they go to the comparator.
2. Measuring contour on comparator.
3. Making intermediate measurements.
4. Checking measurements previously made without resetting measuring projectors.
5. Checking the adjustment of projectors and comparators.

Each Scale is available in 3 sizes—4″, 8″ and 12″

On 12″ size

10X scale measures	1.200″ or .600″ from center each way
20X scale measures	.600″ or .300″ from center each way
25X scale measures	.480″ or .240″ from center each way
31.25X scale measures	.360″ or .180″ from center each way
50X scale measures	.240″ or .120″ from center each way
62.50X scale measures	.180″ or .090″ from center each way

*PATENT PENDING

PRICES ON REQUEST

ENGINEERS SPECIALTIES DIVISION

980 ELLICOTT STREET
BUFFALO 8, NEW YORK

TWIN PLANTS

1919 EAST 19th STREET
CLEVELAND 15, OHIO

Here's where carbide tipped

Cal-Cutters

fit into your production picture!

UNTIL new milling machines are designed especially for carbide tools, you can still double your production with Cal-Cutters. Here's why: Cal-Cutters are engineered to do an efficient milling job using the spindle speeds and table feeds possessed by your present modern equipment! That's been the basic idea behind all Cal-Cutter designs. Some day—when milling machines have been redesigned with unlimited horsepower, faster spindle speeds and table feeds—you'll see even more advanced Cal-Cutter designs. *Meanwhile, don't sacrifice extra production, lower cost per piece, better surface finish* and other benefits that Cal-Cutters can give you!



Ask for a Cal-Cutter demonstration now! You'll be agreeably surprised—whatever the application and metal you're milling!

Free Cal-Cutter Catalog showing various cutter designs and sizes sent on request. Write today!



MACHINERY MANUFACTURING CO.
1911 E. 51st ST., LOS ANGELES 11, CAL.





No peaks to cause wear!

PASSED HIGHEST TESTS DEVISED BY THE NATIONAL BUREAU OF STANDARDS

A notable advance was made in gage block manufacture when FONDA engineers developed the "ULTRA-FINISH" which eliminates *peaks* on the gaging surfaces.

It is the *peaks* that naturally are first attacked by wear—and soon are shorn off, leaving the block undersized. It is the *peaks* that cause the need for oil or other film to fill in the valleys, in order to provide suitable adhesive force in wringing. A film that of itself introduces further inaccuracies!

To all intents and purposes, FONDA gage blocks . . . with the "ULTRA-FINISH" . . . have no peaks on the gaging surfaces—and require no film for wringing. The amazingly smooth and wear-resistant gaging surfaces insure a *maintained* high accuracy . . . setting new modern standards in fine-precision measurement.

Write for detailed Bulletin F

Prompt Deliveries

FONDA GAGE COMPANY
Stamford, Connecticut
Agents in all principal cities throughout the World

29



FONDA
Gage Blocks

Don't be Satisfied with your production! Change to TECO *Cemented Carbide* and get

- More pieces between grinds
- More grinds per tool
- Lower tool cost
- Less down time



Because you are running with "Carbide Tools" is no guarantee of top production. There's a big difference among carbides. Plant experience proves that TECO Cemented Carbide consistently outproduces other carbides in job-for-job comparisons.

Make this test: Put TECO Carbide Tools on any machine in place of present carbide tools. Run under identical conditions and let actual performance prove the superiority of TECO Cemented Carbide.

Rigidly controlled methods of manufacture give TECO Cemented Carbide greater hardness, density and uniformity—more resistance to wear and breakage. Have a tool engineer discuss your needs. Write for catalog and price list.

IMMEDIATE DELIVERY FROM STOCK can be made on most standard TECO Cemented Carbide tools and blanks.

TUNGSTEN ELECTRIC CORPORATION • 565 39th Street, Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

Representatives: Indianapolis, Ind. Chicago, Ill. Detroit, Mich.



TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CEMENTED CARBIDE**

Allison
COLLET CHUCKS



Above is Allison Indexing base mounted with an Allison #1 chuck doing second operation work.

Model #1 for 1½" 8-thread spindle lathes — with ⅞" collet capacity is unsurpassed as a combination chuck for either first or second operation work.

Allison TOOL & ENGINEERING COMPANY
4031 Whittier Blvd., Los Angeles 23, Calif.

WRITE FOR NEW ALLISON CATALOGUE — SEE YOUR LOCAL DISTRIBUTOR

Now, **Accurate Reflex Torquing—**
faster than thought...



Write for Bulletin No. 15

Buy More War Bonds

This new wrench closely resembles the standard STURTEVANT Torque Wrench and is the same size for capacity. It too can withstand the every day abuse given bench tools and still remain "dead accurate", and can be read from all working angles. But here is the difference — whereas the Sturtevant Torque Wrench depends solely on visual readings to control torque applied to caps, screws, bolts or threaded parts, the new STURTEVANT SENSORY Torque Wrench embodies the new Sensory feature which causes the operator to automatically maintain accuracy while torquing at *reflex speed.*

This Sensory feature operates as follows: A trigger finger is provided which can be set at any desired signalling point. And from there on, until re-set, at the exact instant the "set" torque is reached, the self-cocking sensory action (1) Sounds a loud and distinct click and (2) imparts a definite strong impulse to the hand (3) indicates visually on the dial. Thus, through *three* senses, sight, sound *and* feeling, the operator automatically releases his pull on the wrench by reflex action (even before the conscious mind reports it) making torquing both fast and dead accurate.

Now, Production can be sped up and exact accuracy maintained, far beyond that possible with any other fast-operating torque wrench. Now anyone can rapidly and accurately torque in dark or "blind spots", in deafening factory din under *all* working conditions even if physically handicapped, (blind, deaf or maimed).

Note these results of a field test made on an actual production line of a large engine builder using three 100 foot-pound Sturtevant Sensory Wrenches.

Type of Wrench	Description of Operation	Torque Limits in Ft. Pounds	Number of days in Service	Number of Nuts or Screws Tightened
S-100	Tightening Cylinder Head Cap Screws (21 per engine)	60-65	79	379,447
S-100	Tightening Connecting Rod Nuts (12 per engine)	60-65	79	227,520
S-100	Tightening Main Bearings (8 Main Bearing Cap Screws per Engine)	80-85	67	138,240

Set only once, the day they were put on the job, these wrenches were checked periodically and found to be dead accurate throughout the test — no repairs, no re-settings, no adjustments.

Think what this new tool means to industry in speeding up war production . . . what it can mean to you in postwar competition. Every operator torquing accurately and automatically at reflex speed!

P. A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

IMMEDIATE DELIVERY FROM STOCK



BREN

480 (AC-50)

3AT



3C

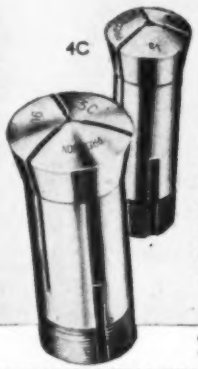
1A

Adapters for 3AT, 3C, 1A

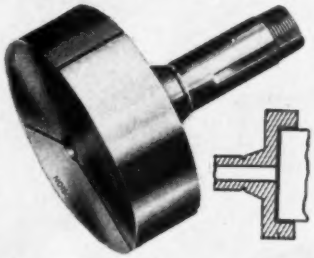
The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

- MODEL 3AT: For 10" Atlas, Logan, 12" Craftsman, No. 700 Powr-Kraft.
- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- MODEL 1A: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
- MODEL 4C: For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.

4C



KLUTCH - KOLLET (Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored $7.50 each.



- 5C KLUTCH-KOLLET NOW READY. List Unbored $10.50.
- PRECISION Collets also available in Hexagon and Square.

GENERAL DIE-STAMPING-TOOL COMPANY • 262 MOTT ST., NEW YORK 12, N.Y.

Choose the Center with the *Helical Groove*

CMD



Longer running time between replacements

To make machines run longer before requiring attention to centers — choose the center with the helical groove — made only by CMD. The exclusive advanced design, with the left-hand Helical Groove, assures more complete and longer lasting lubrication of point and work. No more burned-out center points! No stopping machine to relubricate center! No readjustments of tail stock! When CMD Helical Groove Centers are lubricated with CMD Center Point Oil, running time is frequently increased as much as 1500 per cent.

Write for* FREE *Sample Kit

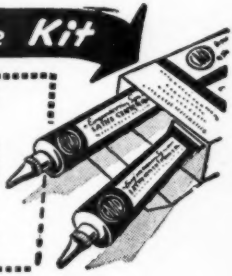
CHICAGO MANUFACTURING & DISTRIBUTING COMPANY
Dept. 10BB, 1928 West 46th St., Chicago 9, Ill.

Send circular on CMD Helical Groove Centers.
Without obligation to us, send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

NAME.....

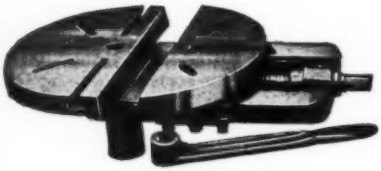
FIRM NAME.....

ADDRESS.....



Use the COMBINATION

DRILL TABLE and VISE



SPEEDS
DRILL PRESS
SET-UPS

Simplifies the most difficult set-ups. Holds work of all shapes securely, without angle plates, clamps or supports. Just drop in the work and start to drill.

The Combination is made in various sizes — diameters from 6" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify shank diameter in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.

GUARANTEE

We guarantee the Combination will save its cost in labor alone in six months. You are the judge.

FREE TRIAL

We will ship to rated concerns under this guarantee, on free trial. Should you decide not to keep the tool we will even pay return transportation. Order Today!

Circular on Request.



WRITE TODAY FOR CIRCULAR

Gives full information and illustrates typical, set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.

Jackson, Michigan



NOTICE!

Replace worn out 6" x 18" Surface Grinder Spindles with this POPE SEALED MOTORIZED UNIT

HERE'S THE STORY IN A NUTSHELL

This POPE Sealed Motorized Unit has a full 1 H. P G-E motor *sealed-in* to run at peak efficiency, without attention, indefinitely.

The extra large SKF Super-Precision, Double Row roller bearings are sealed in, too. No worry about lubrication.

The Spindle also operates vertically or at any angle. Use it for other applications as well as for surface grinders.

When every one of your 6" x 18" surface grinders is equipped with this new and better Spindle you'll be getting *finer finishes* and more production.

Pope precision craftsmanship combines *sealed-in* G-E motor, SKF Super-Precision, Double Row roller bearings, massive construction and closer manufacturing tolerances to produce superior surface finishes and to save time by roughing off surplus metal fast, whenever necessary

That is why we say—"*Replace Worn Out Surface Grinder Spindles By This POPE Sealed Motorized Unit.*"

Tell us what grinders you're operating and we'll give you the replacement estimates.

POPE

REG. U. S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

Threading Problems?

CALL "THE GREENFIELD MAN"

★ Located in every industrial area in the United States, "The Greenfield Man" is probably only a few minutes or hours from *your* plant. He is ready to bring you expert advice on any of your threading operations.

★ By maintaining the largest staff of specialized field men in the industry, the Greenfield Tap and Die Corporation *brings to you* its complete and extensive engineering, research and manufacturing experience and facilities

★ Call *your* "Greenfield Man", through *your* Greenfield distributor, whenever you want help in any phase of threading.





Greenfield literature available on screw threading includes: "Facts About Tapping," "Choosing the Right Tap," and the new "Greenfield Catalog No. 44." Write for copies or any other specific information today.

GTD GREENFIELD

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS



First Aid for Ordnance

We salute the Unsung Heroes of Army Ordnance.

Machines of War wounded in combat can often be salvaged to fight again.

Each tank, each gun, each truck put back in service gives our offensive that much more punch . . . makes it possible to attack the enemy in more places.

Many times under fire while they work, Ordnance Field Units perform miracles of repair and restoration. Without thought of their personal safety, they fight the battle of First Aid for Ordnance.

Yes, we salute these gallant Time Savers . . . Materiel Savers . . . LIFE Savers!



Back the Attack with War Bonds

QUALITY TOOL & DIE CO.

Manufacturers of "Quality" Products

401-15 NORTH NOBLE STREET, INDIANAPOLIS 2, INDIANA


Why HANSEN
COUPLINGS
ARE FIRST CHOICE
IN ALL TYPES OF INDUSTRY
THROUGHOUT THE COUNTRY
AIR, OIL
GREASE COUPLING
GASOLINE COUPLING
ACETYLENE COUPLING
OXYGEN COUPLING
THEY'RE FASTER, EASIER
TO OPERATE, LEAKPROOF!
Production must keep at peak, costs must come down, the two combined mean lower selling prices, larger sales volume, more profits. • Hansen Push-Tite couplings not only increase production, but lower operating costs considerably. They're the fastest, easiest to operate and safest coupling on the market. Operator merely inserts plug into socket, connection is made instantly, no twisting, turning or locking, air is automatically turned on and he is ready to work. To disconnect, operator merely moves sleeve back, plug is ejected and air is automatically turned off. There is a Hansen coupling made for air, oil, grease, oxygen, gasoline and acetylene. Send for free industrial catalog.
HANSEN MFG. CO.
1786 E. 27th ST. • CLEVELAND 14, OHIO



ARO Pneumatic IMPACT TOOLS

FOR NUT SETTING OR SCREW DRIVING

WITH SIMPLE TORQUE CONTROL

REVOLUTIONARY NEW, SIMPLE IMPACT MECHANISM

● Now for the first time you can set nuts and drive screws rapidly and accurately without stretching, stripping or "burning"... made possible with the new ARO impact mechanism with CONTROLLED TORQUE.

Backed by years of testing, proving and perfecting, this amazingly simple mechanism has only four moving parts... dispensing entirely with clutch jaws, springs, adjustment nuts and screws.

Pneumatic powered... light weight... ruggedly built. For greater speed, longer life, less fatigue, lower maintenance costs and higher efficiency... specify ARO impact tools... available in models up to $\frac{3}{8}$" capacity. Write for new catalog No. 44. The Aro Equipment Corporation, Bryan, Ohio.

PNEUMATIC ARO TOOLS
THE ARO EQUIP. CORP.
BRYAN, OHIO

Stellite THREAD PLUG GAGES WILL CUT YOUR GAGING COSTS!



CADILLAC THREAD GAGES

CUSTOMERS SAY:

"5 to 20 times the wear of best steel gages"

If you have a job that is tough on gages, give STELLITE Gages a try!

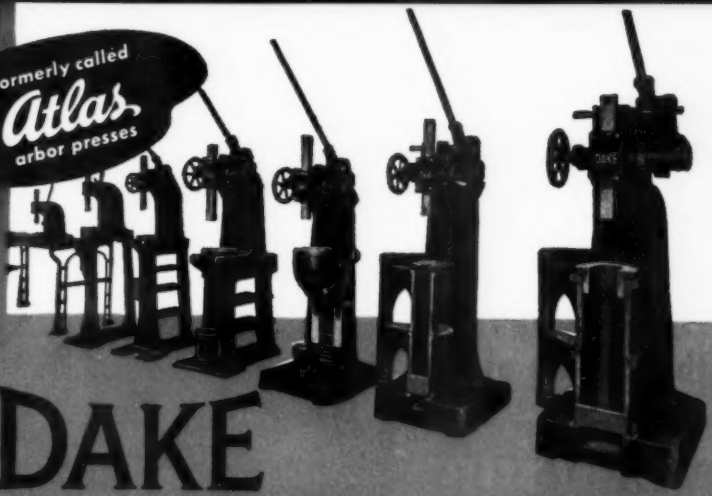
Developed by Cadillac and tested in customers' plants on hundreds of jobs during the past three years, gaging threads in precision parts of highly abrasive materials, Stellite Gages have consistently given 5 to 20 times longer service than the steel gages formerly used on the jobs.

CADILLAC *Thread* GAGES

You will find that Cadillac STELLITE Gages meet the same high standards of quality and superfine tolerances to which you have been accustomed in Cadillac steel thread gages. Give them a trial and see how they will cut your gaging costs! All sizes from No. 6 to 15" in diameter.

CADILLAC GAGE COMPANY
20316 Hoover Rd., Detroit 5, Mich.

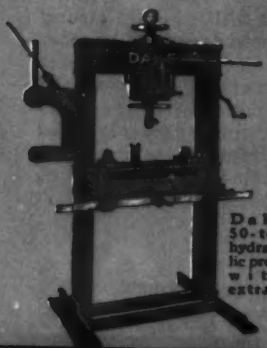
formerly called *Atlas* arbor presses



DAKE
ARBOR PRESSES

Simple and Compound Lever Presses • Hydraulic Presses • Miscellaneous Models

As recently announced, we have acquired all design, manufacturing, and sales rights to the complete line of Atlas Arbor Presses. * * * * All models ... from one to seventy tons ... are now built in the Dake factory to former Atlas specifications. The lever presses incorporate the original Atlas Square Ram which provides larger bearing surfaces, reduces friction, and lengthens the life of the press. * * * * Please send all inquiries and orders for presses listed in old Atlas catalogs direct to Dake Engine Co., Grand Haven, Mich.



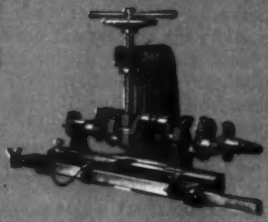
Dake 50-ton hydraulic press with extras.

Simple Lever Presses
5 Models—1 to 2 tons.
3 Models—up to 5 tons.

Comp. Lever Presses
7 Models—6 to 25 tons. Available in bench and floor types.

Hydraulic Presses
2 Models—50 to 70 tons. For work up to 33 and 44 inches.

Miscellaneous Presses
Wheel operated Production Presses
Straightening Presses
Portable General Purpose Presses
Hydraulic Work Heads



Dake Straightening Press for aligning crank shafts and similar shop operations.

DAKE ENGINE COMPANY GRAND HAVEN MICHIGAN

FRICTIONAL SAWING *with* Tannewitz HIGH SPEED BAND SAWS

Is Revolutionizing the Cutting of

SHEET STEEL

Non-Ferrous Materials
(Formed or Flat)

and even Heat-Treated steel up to 1" thick



Everywhere you'll find **TANNEWITZ HIGH SPEED BAND SAWS** cutting various metals in half the time or less than was formerly required by other methods. Millions of teeth per minute generate sufficient frictional heat to make the cutting extremely fast, smooth and convenient. Exceptionally strong, perfectly balanced wheels, hydraulic brakes which are automatically applied in case of sawblade breakage, and many other features designed specifically for high speed operation make these machines vibrationless in operation, perfectly safe and trouble-free. By all means get acquainted with them. Write NOW for "HIGH SPEED METAL CUTTING BAND SAW BULLETIN."

OTHER BULLETINS *worth writing for:*

"SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE," "BAND SAWS FOR DI-SAWING, FILING and POLISHING"

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

WHAT'S AHEAD FOR THE METAL INDUSTRY?

Design for Tomorrow

BRING YOUR PROBLEMS TO THE METAL CONGRESS OCTOBER 16-20 IN CLEVELAND

Problems must still be solved by a wartime metal industry and they will occupy the center of the stage at the 26th annual National Metal Congress and War Conference Display during the week of October 16 in Cleveland's Public Hall.

But scores of wartime developments have important peacetime aspects. A tremendous fund of vital information has been built. To knit these developments into a compact design for tomorrow, more than 150 technical and practical lectures on all phases of the metal industry will be presented. Some 350 manufacturers will participate in the displays. More than 30,000 metal men will attend to once again iron out their problems and plan for the future in their own industrial Congress.

This is your cordial invitation to bring your problems, your developments, to Cleveland on October 16. Make your hotel reservations now through the Housing Bureau, c/o Cleveland Convention & Tourist Bureau, 1604 Terminal Tower, Cleveland 13, Ohio.

For Exhibit Space

Display spaces are still available for companies with products or services for the metal industry. 350 firms have already taken space. For complete information, wire the American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio.

NATIONAL METAL CONGRESS

CLEVELAND'S *Public Hall*



OCTOBER 16 THRU 20, 1944

AND WAR CONFERENCE DISPLAY

Sponsored by the American Society for Metals, in cooperation with the American Welding Society, the Iron and Steel and Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial Radium and X-Ray Society and the Society for Experimental Stress Analysis



In step with your needs

You need not go out of your way to buy Socket Head Cap Screws, Socket Set Screws, Stripper Bolts, Pipe Plugs, Square Head Dog Point Set Screws, Keys, or other Standard Screw Products manufactured by The Chicago Screw Company. These fine products are sold only thru authorized distributors—and there is one near you, ready to take care of your requirements.

You will be pleased with the superior quality of our products, and more than satisfied with the service of our distributors.

ARMY E NAVY

These Fine Products are sold only thru Authorized Distributors

THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 SO. HOMAN AVENUE CHICAGO 24, ILL.

Shapes of Things to Come . . .



Count RFC HAND-CUT ROTARY FILES among those precision tools which—by speeding up and facilitating War production—truly symbolize Victory and the better years to come.

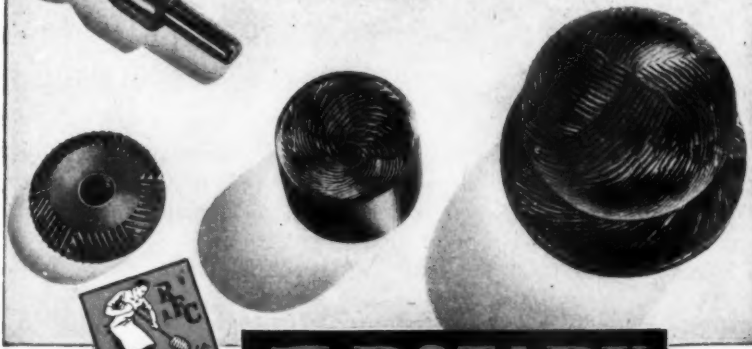
Especially welcome is RFC's part in those exacting odd jobs . . . "special" operations which tend to slow up fabrication, finishing and assembly.



RFC rotary files take care of these mean jobs in their stride—keeping pace with the work routine at its swiftest flow.

This is because RFC special shapes are designed by specialists... men who helped introduce the rotary file to industry, some 20 years past, and who continuously have been adapting it to new applications.

You yourself may find decided interest in some of these RFC special rotary file shapes, in high speed steel or high carbon steel. Let us explain all of our special services. Or write for the helpful RFC Catalog.





The ROTARY FILE COMPANY

FLEXIBLE



CLARK Electric Tools respond readily to changing conditions

CLARK products have been tempered in the school of experience. Their worthiness and flexibility have fitted them for the tremendous tasks of war. Those who use them day after day have learned to look upon them as a true friend — one willing to do a little more a little longer. Good tools, rugged and ready.

Write for particulars.

drills . grinders . sanders

"first in the field" CLARK Electric Tools

JAS. CLARK, JR. ELECTRIC CO.

606 BERGMAN ST., LOUISVILLE, KY.

ACRO



Die set pullers

GONE FOREVER—battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast—accurate—positive. War plants using these pullers report savings as high as 50% in time alone.

ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

Order a set today. Convince yourself of the savings you can make in your tool room. **ACRO PULLERS** furnished in three sizes. Write now for more information.

PROMPT DELIVERY

ACRO METAL STAMPING CO.

332 E. RESERVOIR AVE. MILWAUKEE, WIS.

COOLANT PUMPS

TRADE MARK "FULFLO" REG. U.S. PAT. OFF.

BY-PASS VALVES

The Coolant Hits the Right Spot with a

FULFLO COOLANT PUMP

Surely, constantly, unerringly the coolant is directed by this precision-built pump. Scores of models enable you to use just the right size and type for your particular purpose. Or, if you require special designs the Fulflo engineers will be glad to work with you.



Showing a typical Model FVM installation.

Motor, direct or belt driven
Pipe sizes ⅜" to 1½".



FULFLO BY-PASS, OIL-RELIEF VALVES

Standard or flange types. Non-chattering because the cylindrical piston closes off the port in a shearing manner and does not seat abruptly against the valve.

Write for the Fulflo Mechanical Data Book

THE TRADE MARK "FULFLO" REG. U.S. PAT. OFF. Specialties Co., Inc.
BLANCHESTER, OHIO



It pays to believe in signs . . . sometimes ! !

We're mighty proud of the one pictured above. It is not only our stamp of a job well done, but is your assurance of well engineered, well constructed machine tools.

We are currently in production on the following products:

Universal Tool Grinder
Tool Grinder Fixtures
Drill Chucks
Expanding Mandrels
A. C. Arc Welders
Reamer Drives
Abrasive Wheel Dressers
Hand and Tool Post Grinders

Literature on any or all products will be gladly sent to you on request.

K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA

GROUND FORM RELIEVED CUTTING TOOLS



these CUTTERS are typical of the GAY-LEE line of cutters. We specialize in the manufacture of Gear Tooth Rounding Cutters and/or Pointing Cutters also Gear Tooth Burring Cutters. We make these to customers' prints or we will design the proper tools for the work intended upon submission by the customer of his gear prints.

We also specialize in the manufacture of Clutch Tooth Milling Cutters which are used in milling the teeth of clutch gears.

GAY-LEE cutters combine the desirable qualities of high precision and long life. That is because of our extensive experience in this work and the skill and care used in the manufacture of our cutters.

\- - - - - - -

Proof.. The high quality of GAY-LEE tools is amply attested to by their wide use and by the continuous re-ordering in large quantities by many well known manufacturers.

GAY-LEE COMPANY

Let us submit prices and further information on your requirements.

FERNDALE 20, MICHIGAN

Grobet
ROTARY FILES

Hand Cut and Ground Cut
ROTARY FILES



SEND FOR NEW CATALOG R

Up-to-the-minute, illustrated, catalog of the complete line of Grobet ROTARY FILES—noted for their rugged serviceability under all conditions.

There's a Grobet Rotary File, Cutter, Diesinker's Burs, etc., in size, shape and coarseness of cut for every type of hard and soft metal, plastic, wood, etc.

(Please make requests for catalog on firm letterhead.)

GROBET FILE CO. of AMERICA

421 Canal Street — 1812 F. L. GROBET — **New York 13, N.Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

Plants: New York • Chicago • Los Angeles

STANDARD CARBIDE TOOLS



Standard Tools are tipped with general purpose ("G.P.") grades for "universal" shop use on the majority of all turning, facing and boring operations. They are also supplied for use on STEEL . . . or on cast iron, brass, bronze, aluminum, non-metallics, etc.

Right Hand

Left Hand

GRADES OF CARBIDES

Standard Tools are furnished for the following applications:

- *general machining of steel*
- *general purpose machining of cast iron, brass, non-metallics, etc.*

To insure best results, specify material on which tools are to be used.



Other Standard Stock Shapes are available. Write for Literature.

Prices on Special Carbide Tools on Request.

ACME TOOL COMPANY

200 CHURCH ST.
NEW YORK 13, N. Y.

INDUSTRY POLL POINTS TO PLAN-O-MILL!

Here's how **PLAN-O-MILL** *measures up to Industry's demand*

The Bramson Publishing Company's
PRODUCTION POLL
of the Metal-Working Industry

• Staff editors of this publication believe the answers to these questions may guide readers toward an enlightened outlook on postwar mass production. Answers gathered from the field, from the more than 20,000 readers of this magazine and at its PRODUCTION Round Tables each month, will undoubtedly reflect the thinking of the metal-working industry in the U. S. and Canada.

Question	Yes	No
1. Do you envision greater precision in postwar manufacturing?	70%	30%
2. Where advisable, will you replace pre-war equipment with war-built or D P C equipment?	100%	—
3. Are changes in machine tools indicated to fully utilize improvements in cutting tools?	100%	—
4. As a general rule, should machinery controls be changed so as to provide greater motion economy on the part of operators?	93%	7%
5. Do you favor electronic controls?	3%	97%
6. Are lubrication systems on machine tools today efficient, adequate and accessible?	94%	6%
7. Do you see a trend toward a reduction in stock removal for finish, by such means as precision forming, casting, forging, stretching etc.?		

... trademarks. The ... orders ... PRODUCTION Round Table ... of interest.

July 1944—*Tool Engineer.*

1 Plan-O-Mill does a precision job at a production rate.

3 Plan-O-Mill is up to the minute in efficient use of cutting tools, either high speed steel or carbide.

4 Plan-O-Mill is electrically controlled—one push button for complete cycle.

5 Plan-O-Mill was the first planetary to install electronic feed and speed controls.

6 The answer is "YES" for Plan-O-Mill.



5 PLAN-O-MILL *Firsts*

- First to install General Electric's remarkable new Thy-mo-trol electronic feed control!
- First planetary to mill external threads with standard multiple thread cutter!
- First planetary to coordinate feeds and speeds!
- First to provide absolute control of feed-in!
- First to offer a practical, low cost carbide thread milling cutter!

If your war or postwar products involve internal or external threading, or cylindrical forming, now is the time to replace obsolete, wasteful machines with Plan-O-Mill. Contact your machinery dealer or write direct.

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

5211 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-ED MILLING CUTTERS

★ —*a modern development for trans*

ERICKSON *Precision* COLLET CHUCKS

Model "01" accurate within .0005 or less at the nose. ★ **Model "02" accurate within .001 or less at the nose.**

The Erickson Precision Collet Chuck is outstanding for its super gripping strength and ability to maintain accuracy.
Erickson Engineers regularly solve problems for many types of manufacturers anxious to improve results and profit by savings through proper handling of work.
Uses and applications of the chuck to fit your requirements will gladly be recommended upon request.

U. S. Patents No. 2,228,685. Other patents pending.

The ERICKSON COLLET

OPEN SLOTTED BOTH ENDS
COLLAPSES 1/32" MAINTAINS GRIPPING STRENGTH and ACCURACY



High speeds and heavy feeds may be used, as the 8 point grip and extreme accuracy of concentricity avoid vibration and loosening.

One Erickson Collet Replaces, at least, 7 Single Purpose Collets

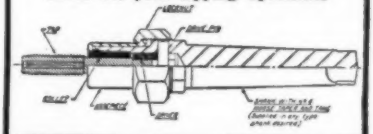


The ERICKSON EXPANDING MANDREL

Uses an inverted adaptation of The Erickson Collet. Inquiries solicited for your requirements.

The ERICKSON TAPPING CHUCK

An outstanding new development. Send for information covering this chuck for your tapping operations



ERICKSON CHUCKS ARE STANDARD EQUIPMENT ON MANY MODERN MACHINES

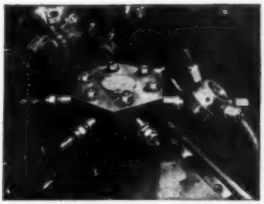
Leading manufacturers of newer equipment have been quick to recognize in the Erickson Chuck, a gripping means that adds to the accuracy and precision of their products. Inquire about Erickson Chucks for standard equipment.

ERICKSON STEEL CO. Dept. D

mitting precision and accuracy ★ ★
from the machine to the job



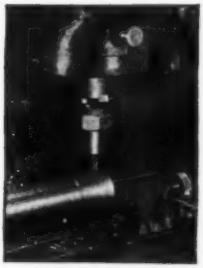
Model 201 High Speed Router Chuck with extended nose piece for pattern following.



Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.



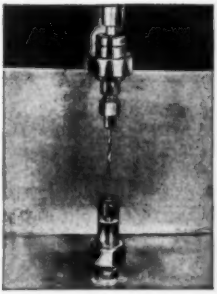
Model 102 Chuck—adapted for standard floating holder operations.



Vertical Milling operation with 101 Chuck.

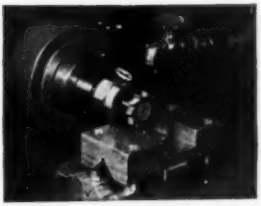


Models 102 and 402 Chucks in use on Automatic Screw Machine.



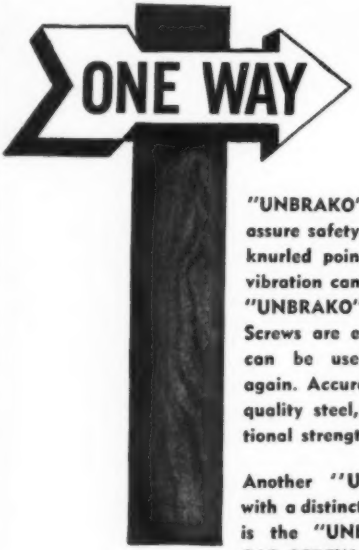
Model 301 Chuck adapted to quick change production operation on upper spindle. Note self-contained, interchangeable drill bushings in special nose piece on lower chuck.

SEND FOR COPY OF BULLETIN "E"



Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

2309 Hamilton Ave., CLEVELAND 14, OHIO, U. S. A.



THE ROAD TO SECURITY

"UNBRAKO" SELF-LOCKING HOLLOW SET SCREWS assure safety because, when tightened as usual, the knurled points dig in and take a firm hold which vibration can't shake loose. Yet "UNBRAKO" Self-Locking Set Screws are easily removed and can be used over and over again. Accurately made of high quality steel, they have exceptional strength and hardness.



"UNBRAKO" Self-Locking, Knurled Point Set Screw. Pat'd. & Pats. Pend.

Another "UNBRAKO" screw with a distinctive locking feature is the "UNBRAKO" SOCKET CAP SCREW. Its knurled head provides an ingenious method of locking it in place after countersinking. Knurling also makes it easier and quicker to turn the screw into place with the fingers — farther and faster — before using the wrench.

Knurling of Socket Screws originated with "UNBRAKO" years ago.



Knurled "UNBRAKO" Socket Head Cap Screw.

Avoid the hazards of losses which loose set screws can cause. Standardize on the "UNBRAKO."

Send For The UNBRAKO Screw Catalog.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA., BOX 606, BRANCHES: BOSTON • DETROIT
INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

Over 40 Years in Business

TOUGH CUSTOMER

The world's toughest customer... that's the United States Navy. Tough in battle – equally tough in buying equipment.

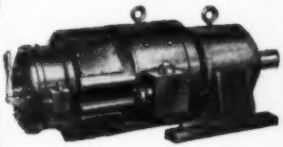
Navy specifications are the strictest ever written. Navy inspectors see that equipment meets or exceeds those specifications. Navy delivery schedules must be met to the minute.

Star built equipment for the U. S. Navy in World War I... and long before Pearl Harbor was assigned the task of building special motors and motor generators to meet Navy needs in World War II. Tens of thousands have been delivered – all substantially ahead of Navy requirements.

While the Navy does not endorse any product, the fact that Star has been a long-time Navy supplier is evidence of the high engineering skill... careful craftsmanship... ability to produce on schedule... inherent in this organization. Remember Star's Navy record when you need a motor or motor generator. Our engineers are ready now to discuss your requirements. Star Electric Motor Co., Bloomfield, N. J.







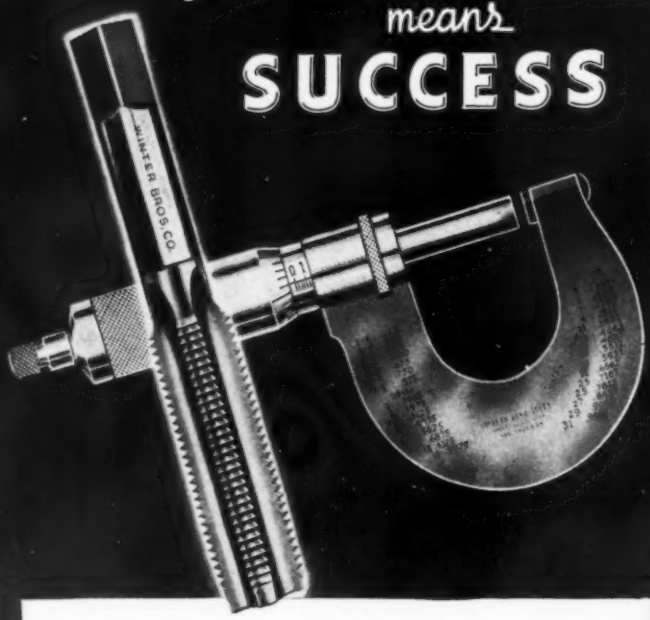
NOW... What's your motor problem?

This powerful, compact Warsaw Elevator motor that lifts and lowers tanks between decks of an LST is typical of Star's work for the Navy – proof of Star's ability to solve any difficult motor problems that may confront you. If one of Star's standard motors (1/20th to 200 H.P.) doesn't meet your exact requirements, Star has the "know-how" to build a motor that will!

STAR MOTORS

POWER PACKAGED AS YOU NEED IT

When PRECISION means SUCCESS



The stamp of approval awarded WINTER TAPS by a host of manufacturers, was earned by making "accuracy" a habit in every operation essential to the production of precision threading tools in the Winter Brothers factory.

For the sake of the critical work you are doing; use these taps with care: Lubricate them well; re-sharpen before they are excessively dull; and your ease of subsequent assembly — without rejects — will prove to you that WINTER TAPS are truly fine threading tools.

A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO. • ROCHESTER, MICHIGAN

Winter Brothers

COMPANY

BRANCH STORES

Wrentham, Massachusetts, U.S.A.

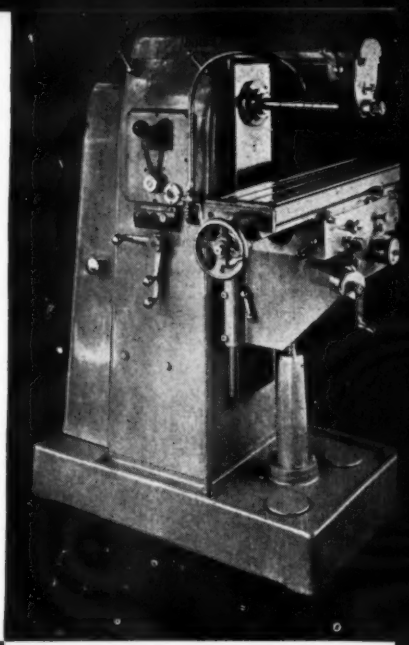
SAN FRANCISCO CALIFORNIA · CHICAGO ILLINOIS · DETROIT MICHIGAN

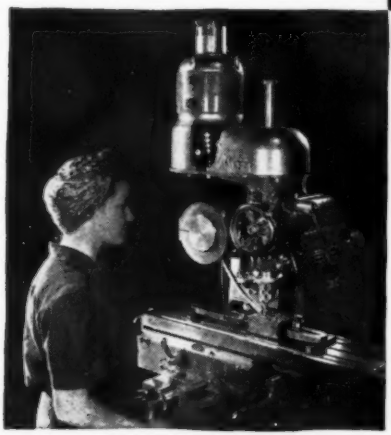
DOUGLAS

PRECISION MILLER

for Toolroom and Production

SIZE 32" x 8" PLAIN





The precision that is built into the Douglas Miller provides efficiency and speed to produce small parts requiring the extreme accuracy essential for today's production.

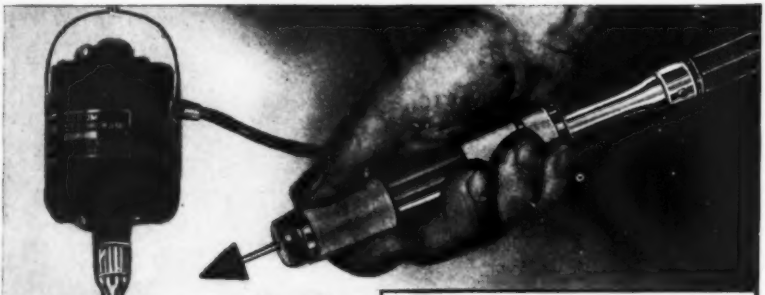
Rigid well balanced design combined with central control makes for easy operation and permits the release of highly skilled labor for other tasks.

A wide selection of speeds meets all requirements for tool-room and production — ample variety of feeds from which to choose.

Timken bearings and helical drive gears are other features to assure a smooth performance. Write Dept. A-9 today for specifications and prices on standard machine and milling attachments available to round out its scope. Prompt Delivery.

DOUGLAS MACHINERY CO., Inc

150 BROADWAY · NEW YORK 7, N. Y.

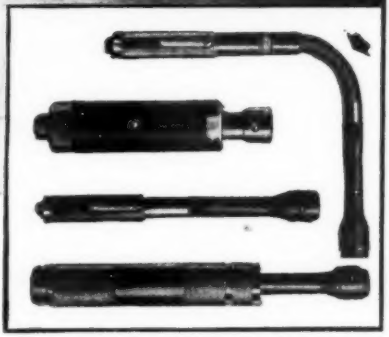


Choice of
American Industry
for De-burring and
Light Grinding
and Finishing Jobs

Foredom Machines are employed in many thousands of manufacturing plants for grinding, finishing, polishing, de-burring, milling, cleaning, etc., replacing old-fashioned, time-killing hand methods.

Foredoms are used in 3 key departments — production — tool room — maintenance. Among the leading industrial plants employing Foredoms are Ford, General Motors, Chrysler, Nash-Kelvinator, Jack & Heintz, Sperry Gyroscope, Bendix, Westinghouse, etc.

Models from $17.50 to $48.75. Catalog No. 459 shows complete line and many uses — may point the way to solving some of today's production and maintenance problems. Write for your copy.



4 Quickly-interchangeable handpiece types — pencil size and larger — some with flexible wrist—see arrow.



Another Foredom Time-Saver

GRINDING KIT
Model 111

One of Foredom's complete line of versatile utility grinding kits preferred by so many plants for emergency and maintenance needs. You too will find it pays to spot them liberally about your plant. Pencil-size handpiece facilitates getting into tight corners for touching-up production set-ups. Complete with accessories $23.50.







Order from your regular Mill Supply House or direct.

FOREDOM ELECTRIC CO., 27 Park Place, N. Y. 7

FOREDOM ELECTRIC COMPANY
27 Park Place, New York 7, N. Y.
Please send us your new catalog No. 459 showing the different uses of Foredom Flexible Shaft Machines.

Name .....
Address .....
City .....
State .....

What the world's largest user says about Machine Tools

A manufacturer whose postwar plans call for a hundred thousand machine tools knows what he wants —what kind of machines will best handle his work. And he has told industry about it!

Here are summarized some of the important features this company wants, along with the Acme-Gridley specifications which meet these requirements.

User's Preference	Acme-Gridley Feature
INCREASED FEEDS AND SPEEDS	
More powerful machines to handle new developments in cutting tools and super-speed milling.	Speeds and feeds as fast as modern cutting tools will stand.
ELECTRIC CONTROLS	
Must be properly located, accessible, protected against dirt and damage, and dependable	Namco Snap-Lock heavy duty Station Control and Limit Switches meet the most exacting military and industrial safety and life requirements.
LUBRICATION	
Every bearing to be lubricated from a central sump. Accessible filters and piping of adequate size.	Central lubrication and coolant systems conform to modern, accepted practices.
ACCESSIBILITY OF PARTS	
Ability to get at all parts quickly without taking entire machine apart, much more important than streamlined appearance.	Machines designed for complete accessibility of operating, tooling, service and adjustment.
CHIP DISPOSAL	
Want wider space between machine ways, with quick chip disposal and separation from coolant.	Entire tooling and cutting area open from both sides, easy to keep clear, and automatic conveyor disposal.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS
THE CHRONOLOG • LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

Now -THREE WEEKS DELIVERY *of* MAGNA-SINES

FOR FAST, ACCURATE GRINDING SET-UPS



The constant demand for Magna-Sines has brought about production operations in the Robbins plant that now make possible a much greater and steadier volume than in months past. As a result, much faster deliveries can be promised—with practically all models being shipped within three weeks after the order is received. Now you have the opportunity to take immediate advantage of the many time-saving, money-saving features of the Magna-Sine for your angular grinding work.

of

ROBBINS SINE PLATES

FOR ANGULAR INSPECTION AND JIG BORING



The same prompt deliveries apply to these non-magnetic Sine Plates produced by Robbins. Not only are these models being used extensively for angular inspection work, but many plants have found them invaluable for jig boring. Like the Magna-Sine, they are available in two sizes in both single and compound angle types. For full information, see your Robbins representative or write directly to the factory.

ROBBINS ENGINEERING COMPANY

318 MIDLAND AVENUE • DETROIT 3, MICHIGAN

THRIFTMASTER



Your parts blueprints will bring recommendations and quotations. Literature on request.



High Production - Money Making

MULTIPLE SPINDLE DRILLHEADS



THRIFTMASTER PRODUCTS

DIVISION OF

ZIMMER-THOMSON CORPORATION

29-05 Review Avenue Long Island City 1 New York



HAVE *Specialists* PRODUCE IT FOR YOU

Every cutting tool produced by Motor Tool is a special job—designed for a special purpose. We make no stock types. The only thing standard about the tools we build is the quality that goes into the making. If you want a special tool that will exactly meet the requirements of the work—place its production in the hands of specialists. Our Engineering and Designing Service is at your disposal.

MOTOR TOOL MANUFACTURING CO.

METAL CUTTING TOOLS

7773 CORTLAND AVENUE · DETROIT, MICHIGAN

Make it a Rule to Call Motor Tool



THE Alcan Highway, hurled through hitherto inpenetrable forests, across mountains, rushing torrents and treacherous muskeg . . . all conquered by man and his machines . . . machines that owe, in great measure, their very existence to the elementary principle of the inclined plane. Used in ancient Egypt it enabled the engineers of the Pharoahs to move into position by sheer human effort the massive blocks of stone that formed the Pyramids. This same principle, upon development became the worm gear — that efficient instrument of power transmission — used in nearly every field of power application . . . without which our machine built civilization might well collapse.

EVEN as the principle of the inclined plane has influenced daily living in the widespread use of the worm gear, so also has Broaching, developed through successive phases from a crude beginning. Today, thousands of parts are made quicker, cheaper and better by modern applications of the broaching principle. In keeping with the trends of the past, even greater developments are in store for the world of tomorrow.



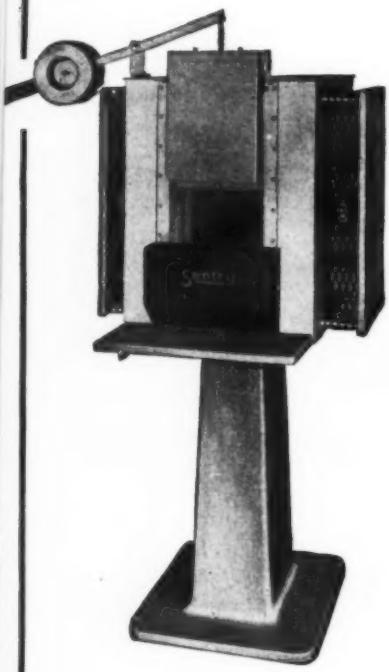
By driving steel balls, and later, crude drifts through the heated part . . . clever builders broached the hubs of the famed covered wagons.

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

See for Yourself!



Sentry Model "Y"
High Speed Steel Hardening Furnace

Any Alloy of High Speed or High Carbon High Chrome Steel quickly and easily hardened — free from scale or decarburization and Maximum Hard.

•

Sentry Diamond Blocks and Sentry Equipment in your plant will give you both economy and quality.

•

No special skill or training needed. Ready to work for you as soon as installed.

No Generators —
No Valves —
Everything Automatic

Bring sample pieces to Booth C-324 at the National Metal Congress in Cleveland, October 16 through 20. A furnace will be in operation for your examination, observation and demonstration of Sentry Quality Hardening.

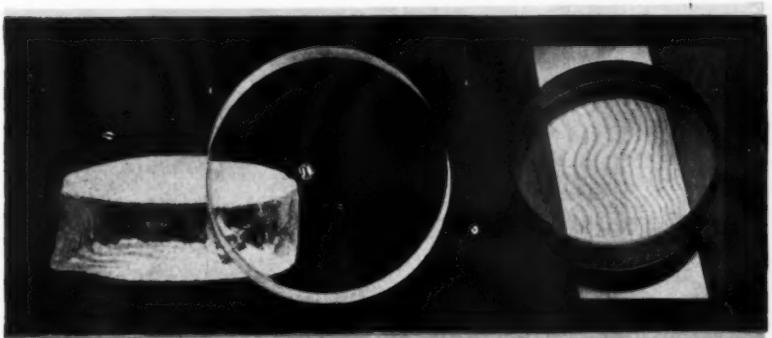
Send for Bulletin 1012-6D

Sentry
Always on Duty

The Sentry Company
FOXBORO, MASS., U. S. A.

Ultimate Accuracy
IN PRECISION CHECKING OF GAGES AND LAPPED PARTS
assured by

Van Keuren
FUSED QUARTZ OPTICAL FLATS



The use of optical flats for precision measurements with light waves was pioneered by The Van Keuren Co. in 1920. The new Van Keuren double surface, pure fused-quartz flats are the result of 25 years of experience. The accuracy and workmanship is superlative.

Fused quartz is highly transparent and has exceptional wearing qualities. The expansion and contraction due to temperature change is 1/16 that of plate glass and 1/6 that of pyrex.

Specify Van Keuren double surface, fused-quartz optical flats for checking flatness of precision lapped parts, maintenance of amplifying gages, and control of gage block wear. They are the most economical to purchase and the most accurate to use.

Worn spot .000022" deep revealed on amplifying gage anvil by means of a Van Keuren optical flat.



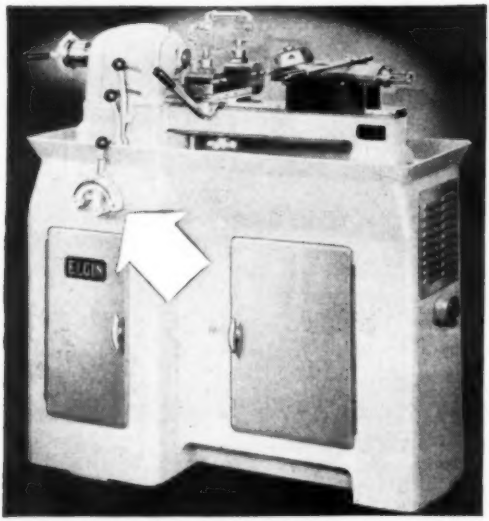
Consult the 144-page Van Keuren Catalog No. 32 for further details. Send for your copy.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

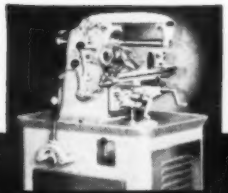
25th YEAR

Light Wave Equipment — Light Wave Micrometers — Gage Blocks — Taper Insert Plug Gages — Wire Type Plug Gages — Measuring Balls —Thread Measuring Wires—Gear Measuring System—Sine Triangles

Select ELGIN *with* »



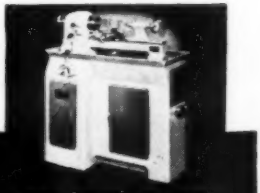
Elgin Precision Hand Screw Machine equipped with Variable Speed Drive. Any speed from 120 to 3780 rpm is quickly available without stopping spindle. 1" collet capacity (No. 5C collet) 9" swing.



Elgin Horizontal Bench Milling Machine with Variable Speed Drive; 85 to 2750 rpm; 1" collet capacity (No. 3C collet). Table 4¼" wide x 18" long.



We can also furnish Elgin Collets in all standard and special types, in any required size for your work.



Elgin Precision Bench Lathe with Variable Speed Drive; 120 to 3780 rpm; 1" collet capacity (No. 5C collet); 9" swing and 17" between centers. Sturdy and accurate.

> the VARIABLE SPEED DRIVE



This Variable Speed Drive places at Operator's Fingertips, instant control of any speed in a wide range of rpm (120-3780 and 85-2750).

for Ultra-Precision

In metal-working plants all over the country where small parts for combat equipment are being machined to split-thousandth tolerances — you'll find the most exacting kind of jobs being put on Elgin Precision Machines like these!

Topnotch performance on "rush" war jobs is assured by such established Elgin features as: Perfectly sustained precision when the going is toughest, versatility on an extremely wide variety of work, smooth operation, simplified control . . . and real speed.

And now, to assure Elgin users the ultimate in precision and fast output, another feature has been added: THE VARIABLE SPEED DRIVE. Each of the three Elgin Precision Machines illustrated here is equipped with a Variable Speed Drive which places at the operator's fingertips any speed in a wide range of RPM (120-3780 and 85-2750). Instantly, without stopping spindles and without shifting belts, the operator can obtain precisely the correct speed for every operation. That means super-accuracy on every operation, from roughing through finishing!

Check the specifications listed herewith in conjunction with the Elgin Precision Hand Screw Machine, the Elgin Horizontal Bench Milling Machine and the Elgin Precision Bench Lathe. Note the Elgin Collets at the left. Then write us for further data on prices and deliveries.

Let Elgin Precision Tools speed your production-for-Victory!

ELGIN TOOL WORKS
1772 BERTEAU AVENUE
CHICAGO 13, ILL.

IF

you are engaged in

DRILLING
MILLING
TAPPING
SLOTTING
or
ASSEMBLY
OPERATIONS

..you can Save Tooling Time... Reduce Production Costs... Increase Profits

U. S. Patent
No. 2,315,318



THE UNIVERSAL JIG VISE..."The Speedy Production Tool with the Vise-like Grip" . . .

will enable you to RECONVERT your plant—re-tool completely, or a step-at-a-time—at a fraction of the cost and DAYS sooner than you are now planning.

A ready-to-use Production Jig, you can standardize both your tooling and production on a vast majority of your Drilling, Milling, Tapping and Slotting operations. Saves you HOURS of tooling time. Gets you into production DAYS sooner. Amazingly speedy—loading and unloading—it definitely does *pull down production costs.*

KNOW this amazingly speedy production tool NOW

Know the tooling time it can save you; the ease and speed with which it can be shifted from one job to another. Know its ability to pull down production costs.

Order a sample Vise. Put it on a "thin-margin" job. Time-study its production performance—then you will really know what it can do for you—where it will fit in and how many you will need to RECONVERT.

NEW BULLETIN No. 11

. . . featuring 8 time and money-saving, Tooling and Production "Short-Cuts" on request.

$29.75
F.O.B.
CHICAGO

J. M. SHORT & ASSOCIATES
53 W. JACKSON BLVD. CHICAGO 4, ILLINOIS
NATIONAL DISTRIBUTORS

Don't Lose Vital WORK HOURS with ONE LONE GRINDER





One lone grinder surrounded by several men waiting to use it means lost production and wasted work-hours. Several Low-Cost Queen City Grinders conveniently placed throughout your plant will quickly pay for themselves in time saved and increased production. Queen City Grinders meet every production requirement, whether it's large or small lots. Send for new catalog giving complete details and prices. Agents in principal cities.



(Illustrated) Model 3-F, 1 H.P. Queen City Heavy Duty Grinder. A low-cost, ball-bearing grinder of unusual productive capacity and durability . . . built to handle the heaviest loads. Completely equipped, ready for instant use.

QUEEN CITY
MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO

Turning AND Centering



IN **1** OPERATION

With R and L Tools

This Combination Tool is the only Right and Left Hand tool on the market. Can be changed from right to left and vice versa in 10 seconds. Replaces 14 tools costing 4 times as much.

Here are some of the multiple operations that can be done with the R and L: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameter.

You can readily see the enormous savings in time, trouble and money that can be effected by the use of R and L Turning Tools.

Write for 44-page booklet describing all the uses of R and L.

R AND L TOOLS

1827 BRISTOL ST. NICETOWN, PHILADELPHIA, PA.



See this New 30-Minute Movie and Save Months of Postwar Planning



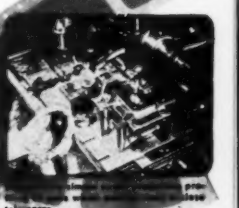
(Above) Complex irregular shapes and contours are easily duplicated from inexpensive plaster models.



(Above) Flexibility of Duplicator Control solves many industrial problems.



(Above) A multiple-[illegible] engraving.



This new Gorton Sound Motion Picture, in colors—"An Exact Duplicate"—shows latest techniques on many jobs like those you'll tackle after "V-E Day."

Yes, the 30 minutes that you'll spend seeing "An Exact Duplicate" may give you the practical solution to that tough postwar production problem that is on your drawing board today. This motion picture, filmed in color and sound under actual machine shop conditions, shows Gorton Tracer-Controlled Machines *in use* on plastic die and mold jobs, forging dies, high production profiling, milling, 2 and 3 dimensional engraving and manual and electric duplicating.

Available now without charge—for showing to technical societies, company groups, conventions, training schools, and other organizations. Write us today for further information, giving choice of three tentative dates.

GEORGE **GORTON** MACHINE CO.

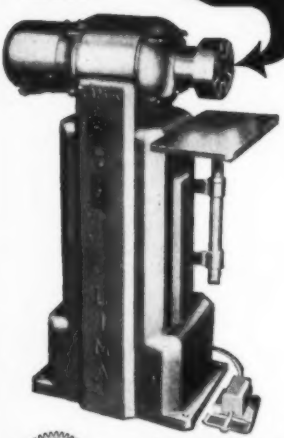
1910 RACINE STREET, RACINE, WISCONSIN, U.S.A.

Quick Change in Work Set-ups...



= SPEEDY PRODUCTION IN POLISHING . . . BURRING or LAPPING OPERATIONS

INTERCHANGEABLE FACE PLATES AND REGISTER PLUGS



Lima Magnetic Polishing Lathe chucks are designed and constructed for quick changes in setting up work. Interchangeable face plates and register plugs make it adaptable to many different sizes and shapes of work to be polished, burred or lapped, using only one chuck unit. For example: By using interchangeable face plates and register plugs, a 4" chuck will accommodate pieces ranging from ⅞" in diameter to 3½" diameter. Lima magnetic chucks are furnished in standard sizes of 4", 6", 8", 10" and 12" diameters.

Standard or special face plates and register plugs to hold work can be supplied with the Lathe, being designed and built to your particular specifications. Face plates are constructed with brass magnetic separators, insuring long, trouble-free productive life. The chuck being magnetic, leaves no holding marks on work such as caused by a conventional chuck or collet.

The self centering "step-release" foot pedal control introduced by Lima Engineers is an important feature in the speedy operation of this Lathe. It controls all operations of the motor and chuck; starting, magnetizing, stopping and demagnetizing, allowing the operator freedom of both hands for speedy placing, processing and removing work from the chuck.

A full wave type rectifier unit to convert AC current from the line to DC current for operation of the chuck is self contained in the Lima Magnetic Polishing Lathe. No other DC source necessary.

Wire or write today for Engineering Bulletin which fully explains the operation and application of Lima Magnetic Polishing Lathes.

Manufactured by

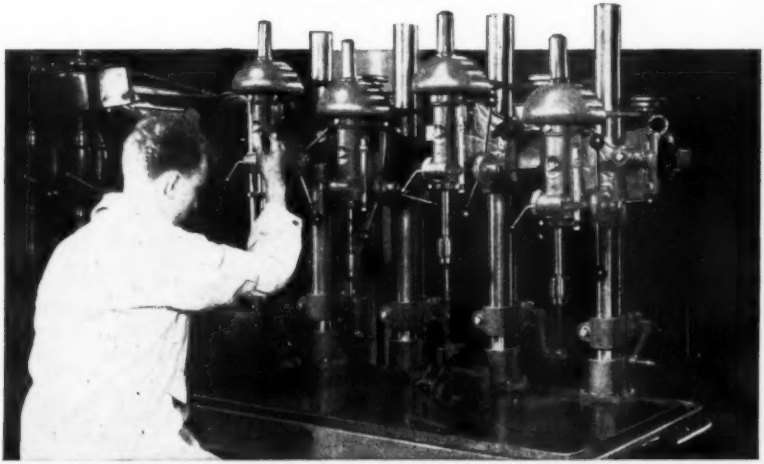
The LIMA ELECTRIC MOTOR Company
293 FINDLAY ROAD
LIMA, OHIO, U. S. A.

MAGNETIC POLISHING LATHES GEARSHIFT DRIVES PEDESTAL GRINDERS ELECTRIC MOTORS

Atlas DRILL PRESSES

One Machine PRODUCTION LINE

When you have a series of drilling and tapping operations there's one sure way to save many man hours on production and handling — install an Atlas Multiple Spindle Drill Press. 2, 3, and 4-spindle models are available. The massive production oil table — planed square with the drilling spindles — provides plenty of elbow room for handling jigs and fixtures. Drill heads are the famous Atlas 4-bearing "floating drive" design, with the Atlas-developed instant head-positioning mechanism to save set-up time. Complete outfits are surprisingly low cost. Send for literature and full details. Atlas Press Company, 1050 N. Pitcher St., Kalamazoo 13D, Mich.





GENESEE ADJUSTABLE HOLLOW MILLS





(Standard Style H)
Facing & Counterboring
Tool

Cut Cost – Increase Production

with GENESEE inserted blade—

ADJUSTABLE HOLLOW MILLS
FACING & COUNTERBORING TOOLS
SPECIAL PRODUCTION TOOLS

Backed by 35 years experience our Engineering Department is always ready to serve you in your Production Tool problems.

Write for complete Catalog No. 42-J

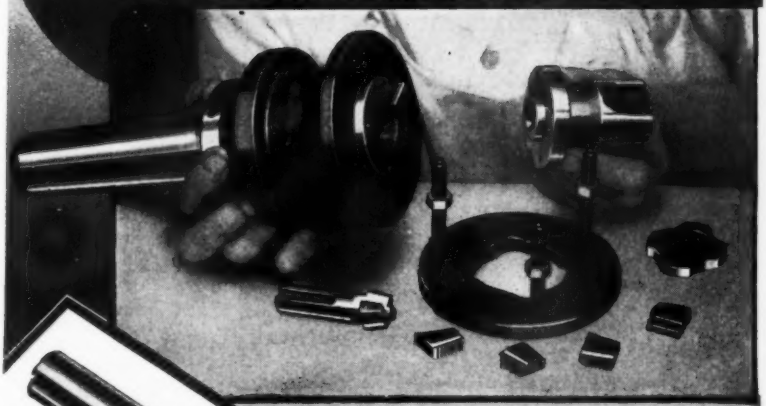
GENESEE
MANUFACTURING CO., Inc.
ROCHESTER 4, N. Y.

Announcing

THE NEWEST ACHIEVEMENT BY *Murchey*

15 Threading Sizes in Only 2 Tools

TYPE L COLLAPSIBLE MACHINE TAP





Showing Chaser Bearing on Pin

Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Tapping Machines. Write for literature on any of these products.

NEW MECHANICAL FEATURES

Separate nose pieces and two bodies provide threading ranges of 1⅛" to 6" in diameter. 15 sizes in all —8 for smaller—7 for larger. Simplified design. Single centralized spring. Fewer pieces. Chasers mechanically stronger. Bearing surface 100% on the pin.

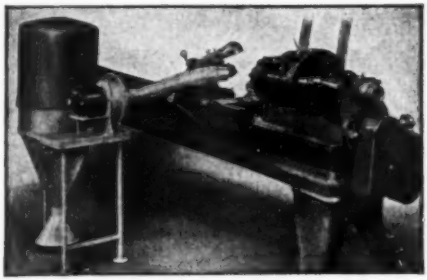
ADVANTAGES OF TYPE L

Flexibility. Better alignment—straighter threads. Greater dependability—trouble-free performance . . . longer life. Can be used on machines with or without lead screws. Tripping mechanism may be operated from face of the work or by the use of a yoke. All exposed surfaces treated with penetrating rust-proofing process.

Write for Complete Information to Dept. M-2

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICHIGAN

MURCHEY



Grinding Dust Particles Will Cut and Lacerate Your Lungs Causing Disease

USE LEIMAN BROS.
POWERFUL AND EFFICIENT

UNIT DUST COLLECTOR

with Surface Grinders, double end grinding spindles, lathes, saws, sanders, etc.

INCREASE PRODUCTION by BANISHING DUST



Unit Dust Collector on Surface Grinder

LEIMAN BROS. 173 CHRISTIE STREET NEWARK 5, N. J.



GROBET FILE CO. of AMERICA

421 Canal Street — New York, 13 N. Y.

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

Plants: New York • Chicago • Los Angeles

ALCO

The Alco Tool Co., after years of engineering research, now introduces these new and improved releasing type tap and die holders for use on Turret Lathes and Hand Screw Machines.

Shown here are the

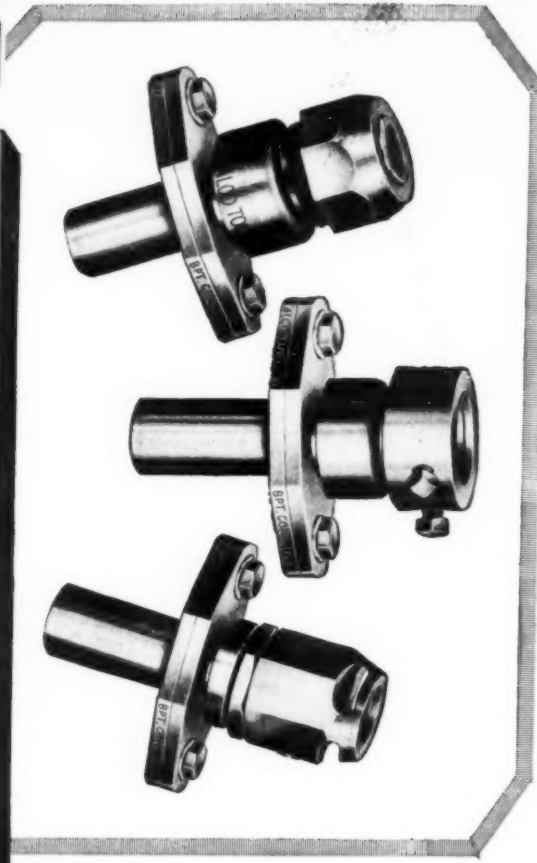
ALCO RELEASING TAP HOLDER which needs no bushings and holds taps really tight. Perfect threads with no tap breakage and with even wear on all leads of the tap.

ALCO RELEASING BUTTON DIE HOLDER. . . . Concentric alignment of dies with work insures perfect threads and makes dies last longer.

ALCO RELEASING ACORN DIE HOLDER. . . . The only acorn type releasing model with adjustable concentric alignment.

In all three models, the new ball clutch operates automatically as soon as the spindle is reversed for unthreading.

Write today for the complete story on these new Alco Tools.



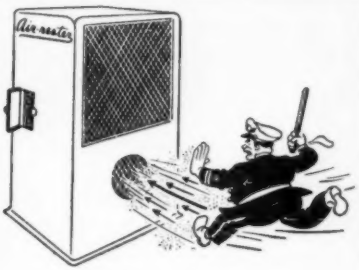
SEND FOR NEW CATALOG NO. 5

ALCO TOOLS

THE ALCO TOOL CO., 252 Birdseye Street, Bridgeport, Conn.

Detroit Office: 908 Stephenson Bldg., Phone Madison 5870
Chicago Office: 6219 So. Kenwood Ave., Phone Hyde Park 6807





For Safety's Sake

ARREST THAT DUST!

Yes, you, too, can now efficiently "Air-rest" the dust, grit, etc., from all types of grinders, buffing and polishing machines with a STANDARD "AIR-RESTER." Look to STANDARD for assistance, and you look to the pioneer of today's dust removal—collecting equipment.

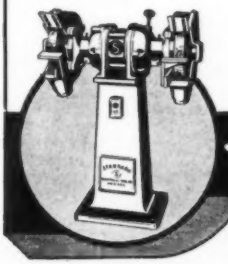
A STANDARD "AIR-RESTER" with its material handling fan costs no more than you pay for dust collectors with air handling fans!

The above photograph shows a 12" grinder with the AR-14 "Air-rester." 4 sizes: 300, 450, 1000 and 1200 C.F.M. The "Air-rester" can be shipped on MRO Rating.

Be on the safe side with an "AIR-RESTER." Write today for complete information.

Manufacturers of STANDARD:

Grinders, Tool Post, Internal, Disc, Carbide, Vertical Spindle, Snagging, etc. ¼ H.P. to 50 H.P. Buffing and Polishing Machines up to 25 H.P. **Speed Lathes.**



The STANDARD ELECTRICAL TOOL Co.

CINCINNATI · 4 · OHIO

2486 RIVER ROAD


At Reliance
Pattern Works... CHICAGO
SKILSAW TOOLS
are
Preferred for Precision
on Wood and Metal!
• Light, compact, powerful ¼ in. SKILDRILL is ideal for fast, true drilling even in closest quarters on wood and metals.
• Perfect, stain-smooth surfaces are produced quickly and easily on metal-faced pattern jobs with Model 84 "Disc Sander!
• Model "B" Belt Sander with powerful vacuum dust pick-up finishes Kirksite-faced die quickly and accurately.
• In making patterns and dies for vital War Production, Reliance sets itself two tough goals: *speed and perfection!* And Reliance achieves those goals with SKILSAW TOOLS! They're designed for the lightness and perfect balance that mean easy handling and accurate work. They're built to rigid standards that insure constant precision. And SKILSAW TOOLS are *extra* powered for *extra* output on every job!
Ask now for a demonstration of SKILSAW TOOLS in your own plant. See for yourself just how these SKILSAW TOOLS *produce a craftsman's results at Wartime speed.* Phone your distributor.
SKILSAW, INC.
5037 Elston Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities
SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

BLUE BOOK
Presents . .

Back in Civil War times, carbon steel tools were the best available for metal cutting. Most of the jobs during World War I were cut with high speed steel. Carbide tooling has made possible many of the production miracles during the course of World War II. Dr. Frommelt covers milestones in the History of the Art of Metal Cutting — the first installment of a new series beginning on page 133

Some sidelights on the Carbide Milling of Steel are offered by H. L. Pope, Cincinnati Milling's Service Manager, in the story commencing on page.....157

BRAZING is a popular shop process worthy of still wider application. Lawrence D. Jennings offers some helpful hints and tips in an interesting story on page 173

MILLING PRACTICE FUNDAMENTALS are discussed in a continuation of this popular series of articles by Dr. Frommelt on page.....199

BRIEF preview of the 1944 Metal Congress starts on page.....237

"LET'S TALK SHOP" this month presents recommendations on Sharpening Cutters for High Speed Carbide Milling; method of Checking Concentricity; simple equipment for Upending Heavy Drums; a Profiling Fixture; a method of Salvaging Worn Ways and other useful kinks in the section starting on page.....243

THE monthly parade of new tools and equipment starts on page.....284 Here you'll find presented, the new Norton Bura-Way Grinder; Nichols Millers; a new three-station cylinder drilling machine by LeMaire; an Anderson Laboratory Press; the new Welch Universal Boring Bar and many other interesting items.

MECHANICS THRU THE AGES.....406




SLOTS 2 SIZES AT ONCE

All Aircraft Sizes and All Materials

SPECIAL PURPOSE

NUT SLOTTER

- 6 CUTTERS MILLING CONSTANTLY . . .
- 2 CONVEYORS RUNNING CONTINUOUSLY . . .
- AUTOMATIC INDEXING . . .
- AUTOMATIC BURR REMOVAL . . .
- AS HIGH AS 3000 SLOTTED NUTS PER HOUR . . . ALL SIZES FROM ⅜ TO 15/16 HEXAGON ACROSS FLATS

Used by All Larger Nut Makers



PELLOW MACHINE CO.
13510 FOLEY AVE., DETROIT 27, MICH.

Setting Performance Records for Precision Machining



South Bend Precision Turret Lathe in the Factory of the Republic Aviation Corporation

High precision and close tolerances have always been the watchwords of the aviation industry. But with the war came demands for higher speeds and better performance. This meant that even closer tolerances had to be established and maintained. We are proud that providing lathes to meet the exacting needs of warplane production is one of our important assignments. Throughout the aviation industry South Bend Lathes are setting enviable performance records for precision machining.

In all metal working industries, South Bend Lathes are giving the same dependable service that they are giving in the aviation industry. Versatile and efficient, they are also used for emergency service work by the Armed Services.

Now, as before Pearl Harbor, our entire factory is devoted only to the production of South Bend Lathes. There has been no lowering of standards because of wartime restrictions and shortages. Improvements have been accelerated. Today, South Bend Lathes are better in every way.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes are available in two sizes: Series 900 with ½″ collet capacity, and Series 1000 with 1″ collet capacity. Write for Catalog No. 100-C.

POST-WAR PRIORITY PLAN

To those who cannot qualify for a wartime priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions necessitate, the order may be cancelled at any time. Write for details of this plan.

BUY WAR BONDS NOW • • • SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA

AS THE *Editor* SEES IT



FOUR years ago, we were struggling frantically to develop armament industries capable of equipping our fighting men, so they could stop the aggressor nations. At that time, machine tools were widely publicized as being the bottleneck in our war effort. It seemed an almost hopeless undertaking, attempting to build the tremendous number of tools that were needed. Machine tool builders tho, with Yankee resourcefulness and superhuman efforts, did manage to deliver sufficient tools soon enough for completion of the greatest armament job in history.

About a year ago, some folks commenced worrying about our postwar problems. One of these worries involved keeping the machine tool industries healthy in view of the tremendous number of new tools engaged in war production thruout the nation.

In an inventory of war surpluses that threaten to be peace time surpluses, Fortune recently declared that more machines tools were built in 1941-42-43 than in the whole preceding 40 years.

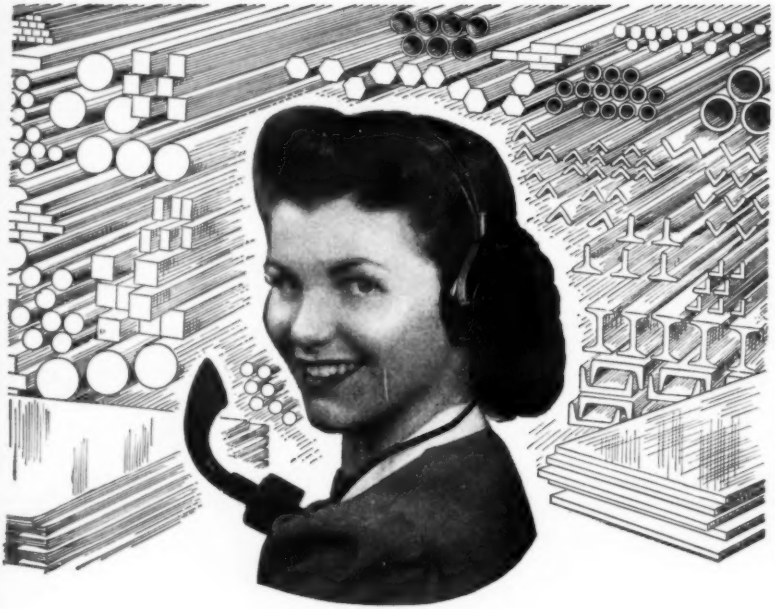
When we were worried in 1940 about having inadequate tool equipment, we were thinking and feeling in terms and dimensions of the preceding 40 years.

When we now worry about having too many tools in 1945, we certainly are not thinking in terms of the 40 years ahead. In round numbers, we do have a lot of tools in this country. However, in the light of accumulated civilian needs and potential buying power, overlooking new product developments and advances in most industries, will we be so heavily overequipped with manufacturing facilities?

The surplus of machine tools we may worry about having after the war, can aid in modernizing many civilian industries. A considerable part of the probable 70% of postwar tools that are more than 10 years old, can be replaced advantageously with new tools or with some of the tools made for the war industries. For some time to come, undoubtedly we shall need standby equipment for armament production. Foreign countries will require vast quantities of tools.

Replacing older equipment in this country with the very latest types of tools will make it possible to cut production costs, reduce prices to consumers and attain the sales volume essential to support post-war employment requirements. In fact, in many industries these newer, better tools may mean the difference between survival and retirement.

Wesley G. Paulson



Call Ryerson When You Need Steel

Every type of steel from stainless to structurals is immediately available from Ryerson stock. Just reach for the phone and call any one of the eleven conveniently-located Ryerson service plants. Our operators will connect you at once with an experienced service man who will see that you get the steel you need—when you need it.

JOSEPH T. RYERSON & SON, INC. Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

QUICK, DEPENDABLE SHIPMENT

The ART of METAL Cutting

By Dr. H. A. FROMMELT*

PART I — HISTORICAL DEVELOPMENTS

THE machine tool as we know it today had its beginning in the first years of the 19th Century. It is the product of two factors, viz., power for driving it and cutting material for its tools. James Watt invented the steam engine in 1769 and thus ushered in the era of power and power-driven machinery.

It is interesting to note that one of Watt's most difficult problems in the beginning was his inability to bore satisfactorily, a cylinder 6" in diameter and 2' long. According to Roe, in his "English and American Tool Builders", (Page 2) he finally had to resort to one which was hammered. "For 10 weary years he struggled to realize his plans in a full-sized engine, unable to find either the workmen or the tools which could make it a commercial success.

His chief difficulty lay in keeping the piston tight. He wrapped it around with cork, oiled rags, tow, old hats, paper and other things, but there still were open spaces left, sufficient to let the air in and the steam out. Small wonder, for we find him complaining that in an 18" diameter cylinder, at the worst place the long diameter exceeded the short by 3/8". And Smeaton, according to Smiles in a life of "Boulton and Watt" (Page 186), when he first saw the engine, reported to the Society of Engineers that neither the tools nor the workmen existed that could manufacture so complex a machine with sufficient precision.

We are likely to forget all of this today, when any feasible thing laid out on paper can be manufactured, because the tools and the cutting materials are available. It was Watt's invention of the steam engine that in turn stimulated rapid development of machine tools and the art of using them. Prior to Watt, it is difficult to imagine the crudity of the tools available in the 18th Century. In all machinery, the principal members were of wood, as that could be worked by the hand tools then in use. The fastenings and smaller parts only were of metal, and consisted of castings and forgings fitted by hand. There were some lathes of

*Research Dept., Wesson Company, Detroit, 20, Mich.

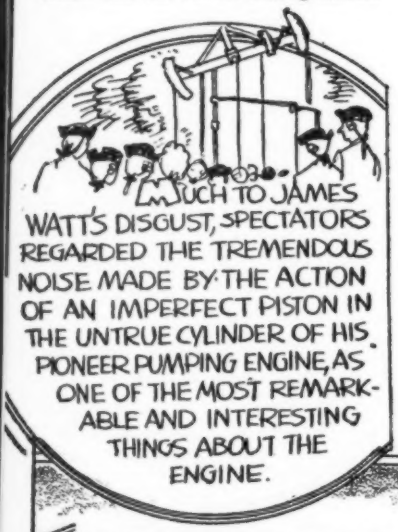


BUILDERS

OF AMERICA'S FIRST PRODUCTION ALL-IRON OR STEEL MACHINE TOOLS ACTUALLY COLORED AND GRAINED THE METAL BEDS AND SUPPORTS TO MAKE THEM LOOK LIKE THE EARLIER WOOD AND METAL MODELS!

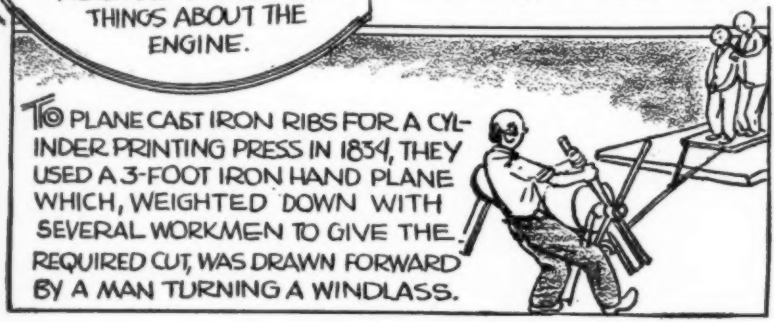
the simplest type. The tool equipment of the machinist or millwright as he was called, consisted chiefly of hammers, chisels and files. The only measuring devices were calipers and wooden rules with occasional references perhaps to the "thickness of an old shilling."

Such was the mechanical equipment in 1775; practically what it had been for generations. By 1850 it bore resemblance to the equipment of today. In fact, most of the changes came in one generation, from about 1800 to 1840. Since that time, there have been many improvements, refinements and advances, but the general principles remain little changed. Since 1840, the most important changes in metal removal and, therefore in manufacturing, revolve around changes in cutting materials and the art of cutting metals.



Just how great the change during the past century in the art of metal removal has been, is indicated by the interesting example of the cost of planing metal as reported by Smiles in his "Industrial Biography" (Page 306) and referred to by Roe in "English and American Tool Builders" (Pages 52-53). Joseph Clement made his first planer in 1820 and some years later, built his "great planer", a remarkable machine from a mechanical and financial standpoint. The cutting speed must have been low, for "the power of one man was sufficient to keep it in motion for ordinary work, tho two were employed to make long and full cuts both ways". For more than 10 years it was the only one of its size, and it ran for many years night and day on jobbing work, its earnings forming Clement's principal income. Smiles says that his charge for planing was 18 shillings, or $4.32 per square foot, which amounted to about 10 pounds per day of 12 hours, or, with two shifts, to about 11 square feet in 12 hours.

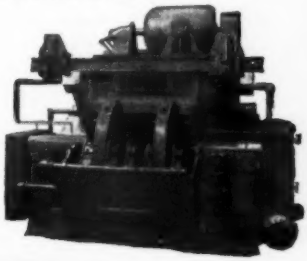
To carbide mill the same surface today, viz., 11 square feet of area of the toughest steel, less than five minutes would be required and the cost should be less than 40 cents. Compare this with 12 hours and $100.00! This change has been made possible, both by developments in machine tools and advances in cutting materials. In fact, the cutting tools and cutting materials have always, thru the history of metal cutting, led the way and made necessary further improvements in machine tools. The importance of these tools to our civilization is indicated by the fact that the various ages, such as the Stone Age, Iron Age, Machine Age



5 POTENT POINTS!



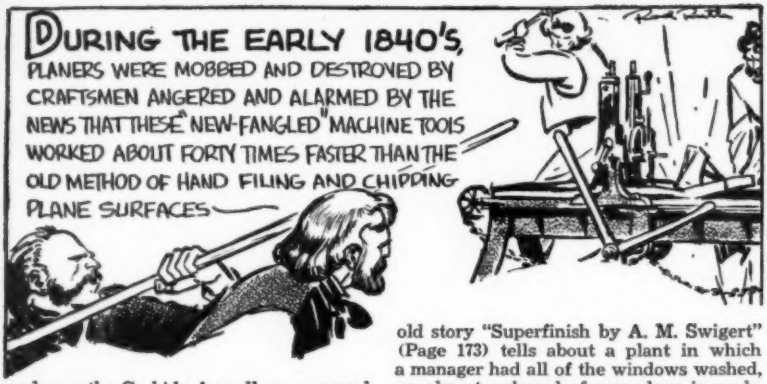
1. We have been building lathes since 1887.
2. LeBlond Lathes today are used on turning operations the world over.
3. The accumulated knowledge of every manufacturing trend in good times and bad—peace and war, gained from thousands of installations is now available to you.
4. Our field engineers are at your service—ready to help you in your development work for the postwar era—particularly along the lines of the difficult, out-of-the-ordinary turning problems.
5. This service is yours for the asking. Contact our nearest dealer or write—



LeBLOND 1-LB CRANKSHAFT LINE BEARING LATHE

ROUGH AND FINISH LINE BEARINGS IN ONE OPERATION

THE R. K. LeBLOND MACHINE TOOL CO.
DEPT. FE46 CINCINNATI 8, OHIO



and now the Carbide Age all were named according to the type of tool equipment available to aid man in his struggle for subsistence.

CARBON TOOL STEELS

During the period when Clement's planer, already mentioned, was the highlight of 19th Century industrialism, plain high carbon tool steel was the only cutting tool material available. With carbon steel, 25 feet per minute was the highest rate that could be maintained on most work. In spite of the fact that carbon steel is one of the hardest materials, its life is definitely limited when used as a cutting tool. This is due, unfortunately, to the effect of the temperature produced by the friction of the chip against the bit. The carbon in the bit or cutting tool decarburizes due to the high temperatures generated, and in consequence softens quickly, thus losing its ability to maintain a cutting edge.

Moreover, the heat treatment, if such it could be called, was in those early days a matter largely of rule-of-thumb as exercised by an individual who made something of a mystery of his craft. The old story "Superfinish by A. M. Swigert" (Page 173) tells about a plant in which a manager had all of the windows washed, an almost unheard-of procedure in early day factories. This so brightened up the dark corner of the tool hardening department that the factory was nearly shut down because of the poor tool bits produced before the cause could be discovered and remedied. The increased light did not permit visual temperature control.

Thus, up to the middle of the last century, less than 100 years ago, the surface foot rate of removing metal was 25 feet per minute—as a maximum—and the cutter life was extremely short. The work of processing tool bits could scarcely be dignified as an art, making the business of removing metal a very unsatisfactory, temperamental and withal unreliable and variable procedure.

SEMI-HIGH SPEED TOOL STEELS

Obviously, under such handicaps, industry was bound to seek better cutting materials and methods. Extensive experimenting began about the year 1850. Some fifteen years later, (1865) Robert Mushet invented, after considerable experimenting what he called "Mushet" steel, a ferrous alloy containing tungsten.



How To Keep Surface Grinding "Out of the Red"

When production costs call for segmental surfacing, you can get more for your money by insisting on Bay State's Blue Flash Segments.

Here's why. To the several natural advantages over solid ring wheels such as more usable abrasive, faster stock removal, increased wheel life—Bay State adds this extra plus:

FRACTIONAL GRADING...three degrees of hardness in each grade instead of the usual one

This extra margin of choice enables you to "fit the grade to the grind" for the fastest, coolest cutting . . . assuring that perfect balance between abrasive and labor costs that can mean the difference between being "in the red" or making a profit on the operation.

Don't forget Bay State's KOOLPORE processed segments—very open and porous—also offer advantages for surfacing operations.

As in segments, so in its entire range of bonded abrasive products, Bay State leads in offering extras . . . the extra know-how that goes into the finest honing and superfinishing stones ever made...the extra care that shapes, trues, and sizes mounted wheels and points on lathes *after* mounting on the spindles instead of pressing them to shape before mounting.

Such extras in manufacturing are the reflection of the engineering skill that goes "all out" to help you get the most from grinding.

Literature about Bay State Segments is yours for the asking.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.



Mushet, an Englishman was at this time manager of the Titanic Steel Company in Sheffield, England. He discovered that the addition of tungsten provided a steel with the valuable property of possessing hardness equal to that of steel cooled in water, even tho cooled slowly in the air from a forging heat. The tungsten in Mushet steel is added in the presence of a considerably higher percentage of manganese than ordinarily used in plain carbon steels. In England this material was referred to as Mushet steel; in this country, as air-hardening steel.

In spite of the obvious advantages of this development, it was not until 1890 that its adoption started in machine shops thruout the country. The surface foot rates were increased by 90% on cast iron and 45% on steel, with better tool performance and much longer cutter life between grinds or reconditioning. Thus, instead of 25 feet per minute on cast iron, air-hardening cutting steel made possible a rate of approximately 48 feet in cast iron and 36 feet in steel.

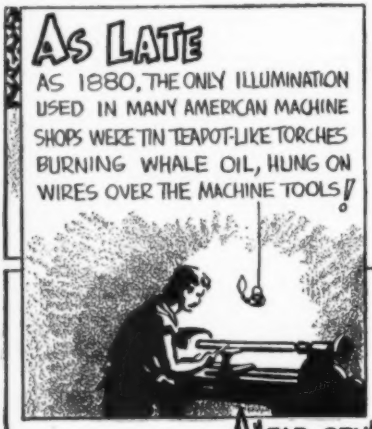
F. W. Taylor's experiments during the years 1890 to 1895, to which detailed reference will be made later, showed that in cutting iron or steel a heavy stream of water thrown on the shaving at the nose of the tool permitted a considerable gain in the cutting speed of self-hardening tools. Up to this time, the makers of self-hardening steels were reputed to have warned the users of this tool steel never to use water on the tools during turning operations.

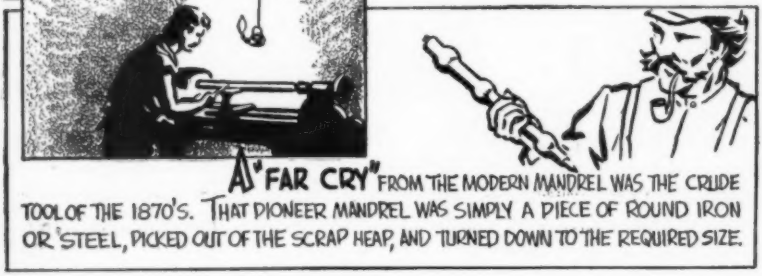
HIGH SPEED TOOL STEEL

It is at this period in the history of metal cutting that the name of Frederick Winslow Taylor enters so dramatically and prominently upon the industrial stage. About the year 1890, it was discovered that a suitable self-hardening or air-hardening tool steel could be made by substituting chromium in combination with tungsten for manganese. This paved the way for the introduction and adoption of the present type of high speed steel for commercial machining purposes.

Taylor and his assistant, Maunsel White, after working for various concerns and carrying on a series of experiments in metal cutting, associated themselves with the Midvale Steel Company of Philadelphia, of which William Sellers was president. To the latter must be given credit for financing the experimental work of Taylor and his co-workers who, in turn, were responsible for the development of modern high speed tool steels, general redesigning of machine tools and scientific management.

Up to the time of Frederick Taylor's work, around the turn of the 19th Century, machining speeds ranged in the neighborhood of 50 surface feet per minute. The work of Taylor and his associates is frequently referred to as a new invention. It is more properly spoken





FOR FINER
FASTER FINISHING

Use DREMEL MOTO-TOOLS



Model 2 Moto-Tool, complete with accessories, as illustrated, in felt-lined hardwood case—$23.50. Model 2 Moto-Tool only, with emery wheel point — $16.50.



27,000 R.P.M.

Used in machine shops and tool rooms for finishing intricate dies. Used on production lines to clean castings, turnings and forgings . . . sharpen tools and do hundreds of grinding, finishing, polishing, burring, routing and etching operations.

Dremel Moto-Tool has AC-DC motor with shock-proof bakelite housing, oil-sealed (oil-less) bearings, and built-in cooling fan. Weighs only 13 ounces — so light and compact a *girl* can handle it with ease. Dynamically balanced armature eliminates vibration and provides precision control. Moto-Tool's high speed (27,000 rpm) permits finer, faster work — conserves cutters.

Dremel Moto-Tools are proving indispensable aids in speeding up war production in such plants as General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Douglas and Northrup Aircraft, and many other "Arsenals."

Try a Dremel Moto-Tool on your own jobs—in your own shop. See how versatile, how indispensable it is — how it saves time and materials. Order from your distributor or contact a Dremel Representative. PROMPT SHIPMENT on orders with proper priority.

Federated Sales, 2437 W. Valley, Alhambra, Calif.
Mill Factor Products, 53 W. Broadway
New York, N. Y.
F. W. Fowler, 137 Federal, Boston 10, Mass.

Whether you have a Moto-Tool or any other type of grinder, use only genuine Dremel shop-tested Accessories — steel cutters, emery wheel points, brushes, sanders.



DREMEL MFG. CO. Dept. 214-K RACINE, WIS. U.S.A.



• Grinding—Sanding—Rotary filing—Polishing—Wire brushing—Drilling—many other operations—all done with one Haskins Flexible Shaft Machine. And done better, too—and faster. This is no single operation machine. In every metal working plant, machine shop, foundry and die shop, there's no end of jobs for Haskins Equipment. Get the most from *your* man-hours. Write for Catalog 45, showing many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 623 So. California Ave., Chicago, Ill.



haskins
FLEXIBLE SHAFT EQUIPMENT

of as the development of a radically different manner of heat treatment. Tool steels of excellent quality for making high speed tools had existed for years prior to the time of the Taylor-White experiments. But the work of these two men brought out the full possibilities of the then existing tool steels, providing the property of "red-hardness". Thus, high speed cutting tools remained hard even tho the temperature, due to the work of removing metal, reached a red heat.

During the years, F. W. Taylor made many experiments in the art of cutting metals. He estimated in that time, he had cut up 800,000 pounds of steel forgings, for the 50,000 tests that were made. In consequence of his patient and careful work, cutting speeds, in terms of surface feet per minute were increased approximately 25%. For the next decade, beginning with 1900, metal cutting was being done at the then remarkably high rate of 75 surface feet per minute.

But Taylor had accomplished much more than just increasing the **rate** at which metal could be removed. It is not only important to remove metal rapidly, but it must be done with reasonable tool life. In other words, a spectacular demonstration of metal removal lasting for a few minutes might be impressive but highly impractical. The tool must remain on the job a reasonable length of time before resharpening and reconditioning, if the operation is to be considered of practical importance and adaptable to a production program. Taylor's work made it possible to keep the tool on the job much longer than had ever before been possible, in spite of the increased surface foot rate. Carbon tool steels are extremely hard—considerably harder than high speed steel—and yet are not nearly so useful. In a heavy cut, the high temperatures developed will quickly break them down. Thus, frequent resharpening is necessary.

Taylor's method of heat treating high speed tool steel resulted, therefore, not only in an increased surface foot rate, but also in increased tool life. And the latter is even more important than the former.

Thus, from 1900 until the outbreak of the first World War, metal was being removed at a maximum surface foot rate of 75 feet per minute. About 1915, an entirely new cutting material was in-

KEEP THAT NEW AIR-TOOL WALLOP INDEFINITELY!

Flashing power is built into all NEW air tools. Cash in on that power, year after year, by installing "Norgrens" in the air line that drives the tool.

NORGREN LUBRO-CONTROL UNITS

. . . Filter dust, pipe scale and emulsions out of the air. Regulate pressures automatically. Lubricate every moving part of the air tool with an air-oil fog caused by oil injected into air stream. Automatic: Starts and stops with the tool. "Norgrens" pay for themselves many times over. PROVE IT YOURSELF! We guarantee full satisfaction. Write C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colo.



Norgren

troduced to the manufacturing world. This non-ferrous composition referred to as Stellite, permitted machining at considerably higher rates of speeds and feeds on some metals and under certain conditions. Stellite is a composition of, among other things, cobalt, chromium and tungsten. It had decided advantages over high speed steel tools for light continuous cuts in steel or cast iron. In turning operations, high surface cutting speed is possible since the tool is not affected by heat as high as 1500° F. In fact, at elevated temperatures, sufficient to produce a dull red heat, Stellite tools are tougher and cut better than when cold.

This cutting material, which contains no iron, is capable of rough turning, for example, a cast iron roll 5′ in diameter by 20′ long and taking a ¼″ deep cut. This operation requires nearly two miles of cutting, and the tools produce two completed rolls from one sharpening.

Stellite is a cast material, very hard and brittle and very resistant to abrasion. But because it is cast and so extremely hard, it is a difficult material to put into final form for tool use. Nevertheless, its introduction represented a step forward in the art of cutting metals. Thus, less than 50 years prior to its introduction, several hours were required to perform an operation that could then (at the beginning of the first World War) be performed in one hour. Twenty-five years previously, it would have required three hours to perform an operation that could be done with Stellite in less than one hour. And even as compared with high speed tool steel, as developed by Frederick Winslow Taylor, Stellite represented a production increase of approximately 100%.

The increase in surface foot rates from the beginning of the industrial revolution, or at the turn of the last century, foreshadow the successive stages of industrial progress, with each increase in production, made possible solely because articles could be processed more rapidly. The American way of life was set in a higher bracket. The standard of living was increased because more things could be produced more cheaply and thus more people could purchase them.

In 1928, the art of cutting metals was





SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION CONTROL

It tells and shows how ROCKFORD CLUTCH and POWER TAKE-OFF applications are saving time, power and money in tractor equipment and a wide variety of industries. Give capacities, dimensions and specifications.

Rockford Drilling Machine Division
Borg-Warner Corporation
1309 Eighteenth Avenue, Rockford, Ill.





The mark of a GOOD File

FORD—ace high in the field for twenty-five years—America's oldest manufacturer of rotary files—producer of the COMPLETE line. Write for catalog today.

M. A. FORD MFG. CO., INC.

746 W. First Street • Davenport, Iowa

HAND CUT FILES • GROUND FROM SOLID CUTTERS • CARBIDE CUTTERS

MILESTONES IN CUTTING TOOL HISTORY

Date	Tool Steel Name and Description	*Surface Speed Feet Per Minute	Maximum Tool Temperature Before Failure †Degrees F.	Degrees C.
1800	Plain high-carbon steels	20-40	400° F	205° C
1850	Alloy carbon tool steels	30-40	400° F	205° C
1868	Semi-high speed tool steels which include the air hardening or self-hardening steel developed by Robert Mushet, of Sheffield, Eng.	40-60	500° F	260° C
1900	High speed tool steel such as developed in America by F. W. Taylor and Maunsel White. This was not a new chemical composition of steel but a new and radical heat-treatment of existing tool steels. This heat-treatment gave tools the property of red-hardness.	50-75	1100° F	593° C
1915	The introduction of non-ferrous alloys containing cobalt, chromium or tungsten.	80-120	1500° F	816° C
1928	Super-high speed steel; tool steel to which cobalt has been added.	65-100	1600° F	871° C
1928	The cemented tungsten carbides which are a molded, sintered material of a hardness next to that of diamonds.	150-500	2000° F	1093° C
1930	The cemented tantalum carbides which are processed the same as the tungsten carbides and have similar advantages.	200-600	2100° F	1149° C

*Rough cuts—solid not intermittent.
Depth of cut—3/16" to ¼".
Feed per revolution—1/32".
First number is for turning cast iron of 160-180 Brinell hardness.
Second number is for turning machine steel of 140-160 Brinell hardness.
†Temperature conversion to nearest whole number.



DON'T GUESS...

Be Accurate with ACME

DRILL JIG BUSHINGS

There's no guesswork when your jigs are equipped with Acme Bushings. On the contrary, accurate drilling is assured, because drill jig bushings from Acme are produced by specialists in precision manufacture.



Acme offers two complete bushing standards, the A.S.A., *plus* the Acme standard line. Because of this you may be enabled to eliminate many special bushing requirements to save time and money.

You are invited to write for details on Acme's complete line of products and services offered to the precision working field.

ACME INDUSTRIAL COMPANY

Makers of Standardized Jig and Fixture Bushings

210 N. Laflin St. Telephone: MONroe 4122 Chicago, Ill.



Too Cold for Him . . .

But Just Right for

Threadwell COLD-TEMPER Taps

Threadwell *Cold-Temper* Taps give you an excellent opportunity to experience the benefits of the new deep-freeze treatment of cutting metals.

Threadwell *Cold-Temper* Taps, scientifically cold treated at *120° below zero*, produce more threads per tap and stand up better when cutting plastics and other abrasive materials. Threadwell *Cold-Temper* Taps are harder yet less brittle than high speed taps that have received only the usual heat treatment.

You can enjoy the superior performance of Threadwell *Cold-Temper* Taps at no extra cost. Why not try them next time you order taps? Your Threadwell Distributor stands ready to give you the same efficient *personal attention* service on Threadwell *Cold-Temper* Taps that he has successfully provided on Threadwell products throughout the emergency period.

Be sure and ask him to furnish you with Threadwell *Cold-Temper* Taps.

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA
EXPORT STOCKING DISTRIBUTORS
CANADA, Bridge Machinery Co., Montreal;
ENGLAND, Skylux Ltd., London and John H. Graham and Co., Inc.
THROUGHOUT THE WORLD

Threadwell
SINCE 1903
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY · GREENFIELD, MASSACHUSETTS, U. S. A.

Grip tools tight — with Universal Collet Chucks



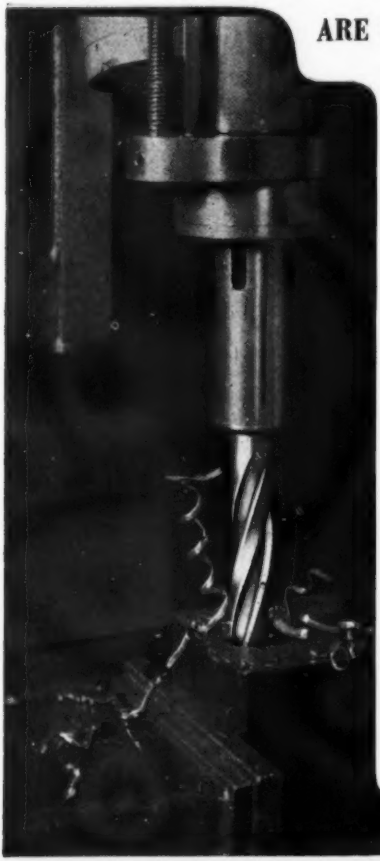
raised to a still higher level with the introduction of a so-called super high speed tool steel. This cutting material was the high speed steel developed a quarter of a century earlier, to which cobalt had been added. Steels could then be machined at surface foot rates as high as 100 feet per minute. This meant, in practical every-day production, that 10 parts or pieces could be machined, where only eight were previously processed. Super high speed steel could be used for the machining of all the ferrous materials, including steel, cast iron, and their alloys, as well as the non-ferrous materials such as aluminum, magnesium, etc.

Altho powder metallurgy presented industry with a miracle tool cutting material about this time, which will be considered in these discussions subsequently, super high speed tool steel is still widely used, tho for many applications it is being replaced by the carbides.

Industrial progress and standards of living can be summarized quickly by scanning the milestones in cutting tool history. This can be done by referring to the accompanying tabulation which briefly summarizes the progress man has made in his struggle with nature to produce more of the necessities, as well as the luxuries, with less and less human effort. In the span of 75 years, from 1850 when alloy carbon tool steels were introduced, to the year 1928 when super high speed steel was made available to the business of producing wealth, three items could be produced at the end of this period while one was being produced 75 years previously. This is a conservative statement of the progress made by industry thru the use of better cutting tools since, actually, production increases have been considerably higher in numerous instances.

Thus, man's struggle with Nature to produce usable and desirable articles from her storehouse of resources and power is, in its final phases, seen as a struggle to make machine tools more productive with the use of more lasting and more effective cutting tools. But the record of the struggle is only in its beginnings. We have still to record the Carbide Age. This product is the result of a technique of powder metallurgy which, since 1928, has revolutionized American industry;

Long Spiralling Chips



ARE CHARACTERISTIC OF ALL PUTNAM HI-SPEED CONTINUOUS PILOT COUNTERBORES

With these standard Putnam counterbores you get:

- **Long spiralling chips rather than small metal particles.**
- **Effortless feeding instead of full strength pressure.**
- **Rapid, smooth and accurate cutting.**
- **Life that is many times that of conventional type counterbores.**
- **Immediate delivery from stock.**

TOOLS THAT CUT FASTER LAST LONGER

HI-SPEED END MILLS
CONTINUOUS PILOT COUNTERBORES
SPIRAL FLUTED CHUCKING REAMERS

PUTNAM TOOL COMPANY
2983 Charlevoix Ave. • Detroit 7, Michigan



SECOMET

DIAMOND WHEELS

Resinoid-bonded for grinding of carbide-tipped tools in large quantities. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.

Metal-bonded for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.

Catalog on request.

J. K. SMIT & SONS

157 Chambers St. New York, N.Y.

and thru a very ingenious adaptation of these powder metallurgy cutting tool materials, a still greater revolution is currently in the making.

The period of the first World War ushered in cemented tungsten carbide as a cutting tool material. Dr. Coolidge, working in the Research Laboratory of the General Electric Co., and reviving powder metallurgy as a technique, which had its beginning in the 18th Century in France, discovered in 1906 a method of making tungsten wire for lamp filaments. Taking tungsten powder, compressing it under high pressures and subsequently sintering it, it was possible to produce a wire with the amazing tensile strength of more than 600,000 pounds per inch. Strangely enough, the first World War, beginning in 1914, halted further development of this remarkable discovery. Germany, however, in the feverish search for tools and techniques to wage a World War, used it as a cutting material and it subsequently appeared on the industrial stage as a miracle metal. Its accomplishments seem in the realm of legerdemain; its results seem to border on the phenomenal.

The Germans produced tungsten carbide by powder pressure and high temperatures. This product was known to the world as "Widia" and was first applied in the Krupp Works for the production of armaments and war materials. There, its effect upon production records, as the post-war world subsequently learned, is simply astounding.

With the cessation of hostilities, tungsten carbide was unveiled to a skeptical world in the early "twenties", more as a laboratory material. The first tungsten carbide cutting material, actually was introduced to American industry as a practical production tool in 1928. It was not at all uncommon in those days to demonstrate the remarkable characteristics of tungsten carbide to an open-mouthed audience by chucking a milk bottle in a lathe and cutting off the neck with a tungsten carbide cutting off tool in a few seconds. And its startling performances, particularly in cast iron, were no less remarkable.

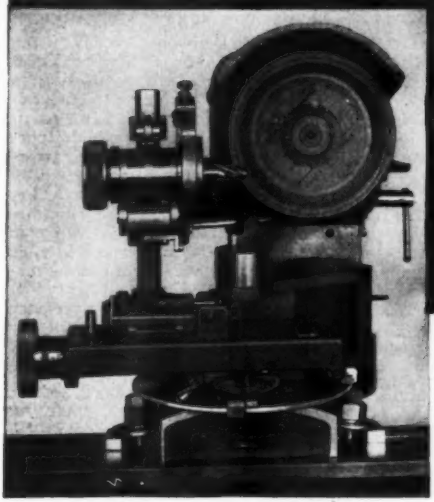
Surface foot rates were increased in one swift and sudden leap by more than they had advanced in all of previous industrial

NEW ATTACHMENT
GENERATES RADII ON END MILLS
WITHOUT WHEEL

Radiform

TRADE MARK REG.

WHEEL FORMING
TOOL
ELIMINATED



Simple; sturdy construction of Meyers Radiform insures fast operation and long; trouble-free performance.

★ ★ ★

Pat. Pending

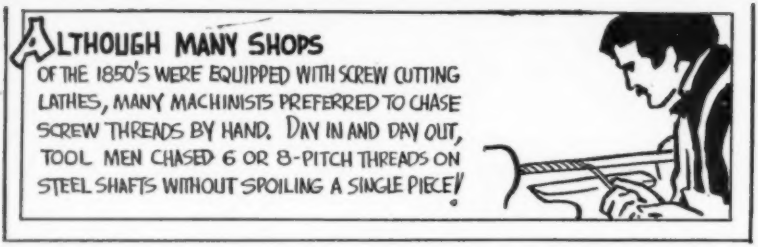
Meyers Radiform Attachment for generating predetermined precision radii on spiral fluted end mills without previous wheel forming. Other Radiform attachments available for supporting tool bits, milling cutters, die sinking tools and other forming tools to be generated directly against a grinding wheel. Time and cost of forming wheels is eliminated.

Write, wire, or call for illustrated catalog and prices

W. F. MEYERS COMPANY • INC.

Established 1888

1018 FOURTEENTH STREET • BEDFORD, INDIANA



history. Three hundred surface feet per minute for metal cutting could be used, compared with the previous high of 100 with super high speed steel, or 75 feet per minute as was common in the days of Taylor and White. And it must not be forgotten that this increase from 75 to 300 feet took place within approximately a quarter of a Century.

Mechanical research is always on the lookout for new materials or better methods of operation over existing methods. Therefore, it is not surprising that every few years outstanding developments are produced. Sometimes material or methods will be available in the laboratory for years, and then finally will be perfected for commercial use. It is interesting to note that with the introduction of tungsten carbide in 1928, cutting materials forged ahead as compared with the performance capacities of then existing machine tools. Shortly, machine capacities were increased to meet the potentialities of tungsten carbide and, indeed, even beyond them. This new challenge was met, as we shall see, by further remarkable advances and developments in cutting materials.

To return, for the moment, to tungsten

don't be a put-er off-er

ORDER TODAY OUR NEW "O-P" ANGLEFEED FIXTURE

TABLE TRAVEL THREE AND ONE HALF INCHES



WEIGHT 110 LBS.



WRITE FOR THIS FOUR PAGE DETAILED FOLDER

POST-WAR SHOWING

Our NEW "O-P" ANGLEFEED FIXTURE is a POST-WAR PRODUCT — designed for cutting down costs — meet competition, in the tomorrow. This NEW ANGLEFEED FIXTURE has a table travel of three and one half inches, and is adjustable to any desired angle within a few seconds. It can be quickly mounted to the table of any Shaper, Drill Press, Jig-Borer, Boring Mill, Horizontal or Vertical Milling Machine or Surface Grinder. The NEW "O-P" ANGLEFEED FIXTURE is a great timesaver. Don't be a — put-er off-er—order now.

AUTOMATIC MACHINE & TOOL CO.
ENGINEERED PRODUCTS
AUBURNDALE, MASSACHUSETTS

PATENT NO. 2329135

132 CHARLES STREET, AUBURNDALE, MASS.

POSITIVE TOOL BIT RIGIDITY

with the New Clark ADJUSTABLE TOOL HOLDER



Higher Machine Speeds, Faster Feeds, and Deeper Cuts!

Vise-grip jaw exerts pressure over full length of cutter channel . . . not just at one point . . . to hold four or more sizes of round or square tool bits . . . without sagging or breaking . . . *at higher speeds, with heavier feeds.*

With equal rigidity, the screw-operated jaw clamps large, heavy bits or short stub bits . . . under size or out of round bits . . . dual narrow tool bits for cutting-off or special forming operations . . . carbide bits and boring bars and bits of brittle alloys. With this new Clark Tool Holder, the operator has an unobstructed view of the cutting edge, for better work control.

Write for complete catalog

SPECIFICATIONS

LEFT OR RIGHT HAND MODELS

With 15° Cutter Channel		With Parallel Cutter Channel	
Model 60 (Size 0)	Takes 1/8 to 5/16 tool	Model P60 (Size 0)	Takes 1/8 to 5/16 tool
Model 61 (Size 1)	Takes 3/16 to 3/8 tool	Model P61 (Size 1)	Takes 3/16 to 3/8 tool
Model 62 (Size 2)	Takes 1/4 to 1/2 tool	Model P62 (Size 2)	Takes 1/4 to 1/2 tool
Model 64 (Size 4)	Takes 5/16 to 5/8 tool	Model P64 (Size 4)	Takes 5/16 to 5/8 tool



carbide, it must be branded first of all as the hardest synthetic material known to man. Its hardness is only slightly less than that of diamond.

Tungsten carbide is made by forming, under heavy pressure, powders of tungsten, carbon and cobalt to the desired size and shape. These blocks are sintered at a high temperature in a reducing or inert atmosphere. After this, the material cannot be cast, poured or in any way heat treated. It can be ground to a useful cutting shape and condition with a diamond wheel. A plastic or metal disc is impregnated with small diamond particles or dust and this, in turn, is used as an abrasive capable of shaping and sharpening tungsten carbide.

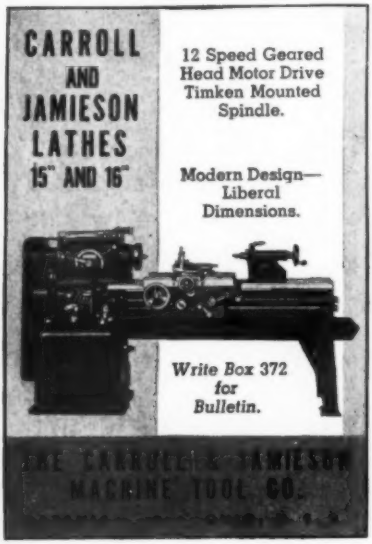
As a cutting material, tungsten carbide is generally used in very small pieces or wafers. Erroneously, this is attributed to its high cost, which at the time of its introduction was $440.00 per pound. (At the present time tungsten carbide and its associate materials are selling for approximately $16.00 per pound.) As a matter of fact, small particles of tungsten carbide are brazed to steel bits for two important reasons. In order to provide the necessary support for the tungsten carbide, which is relatively low in tensile strength, tips or wafers brazed to single bits are used in such machine tools as lathes, planers, shapers and boring mills. Likewise, the tips are brazed to the lips of the milling cutters, drills, reamers, etc., to permit such operations at the greatly increased speed of which tungsten carbide is capable.

Tungsten carbide as originally produced, tho possessing superior advantages and remarkable cutting characteristics for cast iron, was not so successful in machining steel and its alloys. Surface rates as high as 1500 feet per minute, however, were common in the machining of aluminum and the relatively tough aluminum alloys.

Beginning with 1928 and the introduction of tungsten carbide, the production of wealth thru power-driven machines was increased over night as much as three times in the lower brackets, and 10 times in the higher brackets. No other single cutting material or metal-removing technique has produced such a revolution in the history of manufacturing as tungsten carbide. But the story of man, striving to reach out for ever and ever greater production of wealth has only begun. As we shall see presently, the use of tungsten carbide led to feverish laboratory activity in search for other miracle working materials. This has been accomplished with the introduction to industry of carbides that make use of such rare materials as tantalum and titanium. These will be discussed in a subsequent session.

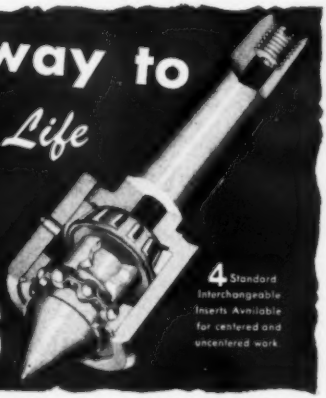
(To be Continued)





Pointing the way to *Longer Tool Life*

IDEAL LIVE CENTERS



Increase Tool Life — Handle heavier loads — permit deeper cuts at higher speeds because they rotate with the work. Built for precision jobs. Where standard inserts cannot be used, special inserts may be made to suit the requirement. Centers with Morse tapers carried in stock.

ELECTRIC TACHOMETER

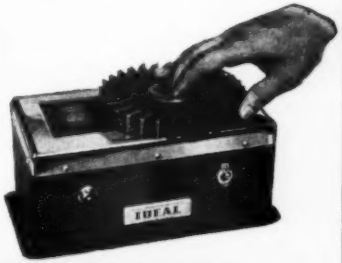


A new method of checking shaft speeds. Attachment provided so that surface speeds can be read directly in feet per minute. Two ranges — 0 to 2500 RPM and 0 to 5000 RPM.

DEMAGNETIZER

A single pass across the Demagnetizer removes metallic dust, flakes, fine chips, etc. Keep Tools Sharp Longer. Powerful — Portable. Two sizes.

Write for FREE Machine Tool Catalog.



★ **IDEAL Sycamore** ★

★ IDEAL COMMUTATOR DRESSER CO ★

1441 Park Ave. Sycamore, Ill.

Sales offices in all principal cities. In Canada: Irving Smith, Ltd., Montreal, Quebec.

Bedway accuracy maintained

Even though subjected to grueling service during wartime, the flame-hardened bedways of Monarch Lathes will retain their accuracy for peacetime operations.

The flame-hardening process was first adapted to machine tools by Monarch, in 1937. Since then, more than 18,000 Monarch Lathes with flame-hardened bedways (as well as many other important surfaces) have proved the practical value of this method. It gives cast-iron bedways a hardness equal to that of hardened steel, yet preserves the valuable qualities of the microscopic particles of graphite. Among other advantages, graphite provides a lubricative property to cast-iron sliding surfaces that is not found in steel. Thus bedway accuracy is maintained even under the most severe use.

The inset illustration is an unretouched photograph (about ¼ reduction) of a section of bedway from a Monarch Lathe and shows the depth of the hardening through which are distributed these graphite particles. A bulletin describing the process will be sent upon request. Ask for Bulletin No. 194.

Flame-hardening is but one of many outstanding developments in lathe design which have been made by Monarch. The same progressive engineering which has built Monarch's reputation in the past can be depended upon to maintain Monarch leadership in the future.

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

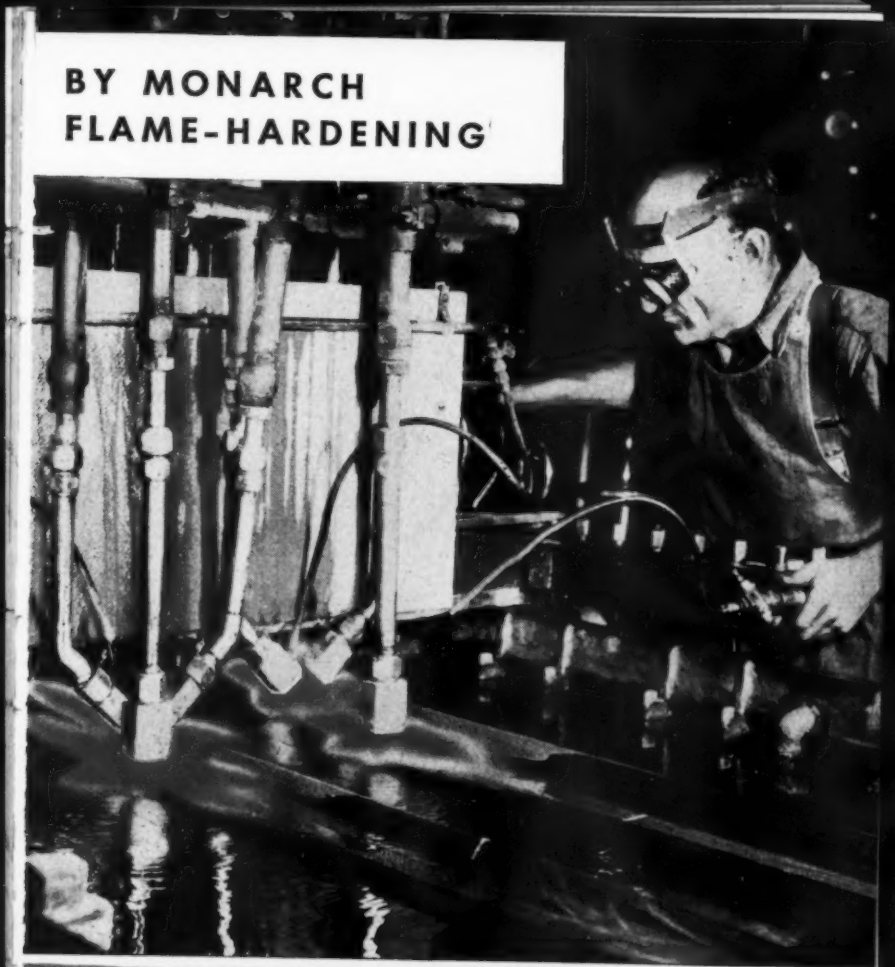
DIRECT FACTORY BRANCHES AT

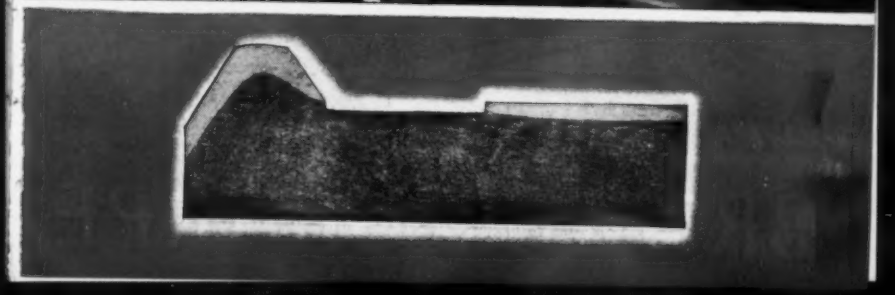
801 Fisher Bldg., Detroit 2, Mich. • 10465 Carnegie Ave., Cleveland 6, Ohio
622 W. Washington Blvd., Chicago 6, Ill. • 1060 Broad Street, Newark 2, N. J.
512 Empire Bldg., Pittsburgh 22, Pa.

Representatives in principal cities



BY MONARCH
FLAME-HARDENING





Simplify Magnetic Chucking
with
PERMANENT MAGNET TY KS

NO WIRES—NO HEATING
NO OPERATING COSTS

Permanent magnet type chucks are ready for instant use on any machine of suitable size as well as on work bench or surface plate. No electrical connections of any kind are needed. Send for complete catalog. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

For sale only in the United States of America and its Territories and in Canada.

RECTANGULAR MODELS
*2½ x 5
5 x 10
6 x 18
8 x 24
12 x 36
*Differs from Illustration



ROTARY MODEL 9" Diam.

. . . We urge buying through the Distributor

BROWN & SHARPE

CARBIDE MILLING OF STEEL

By H. L. POPE*

PROGRESS toward a merger of art with science in the field of milling has been greatly stimulated during the past few years by the employment of super-high speeds, carbide cutting tools, and extremely careful determination of interrelated tooth angles. The possibilities presented by these new considerations have led, not only to a demand for their scientific exploration, but also to a need for a definition of terms agreed to and understood by all engineers. Dr. Frommelt** has already mentioned some terms such as "hyper milling", "negative rake milling", etc., and the term which seems most acceptable is the title of this discussion, namely "Carbide Milling of Steel".

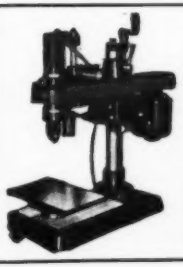
There are several terms upon which some discussion might be profitable. We recognize the term "rake" as the angle of the cutting tooth face upon which the chip is formed, and this cutting tooth face, generally being a plane surface, has an angle in two component directions, namely in relation to a radial line extending from the rotating center of the cutter to the cutter periphery and also in relation to the line called the axis of the cutter. The one rake angle as viewed from the end rotating face of the cutter we refer to as the "radial rake", because it is measured in relation to a true radial line, while the other rake being viewed from the outer diameter of the cutter and measured in relation to the axis or axial line of the cutter might properly be referred to as "axial rake". This axial rake is sometimes incorrectly termed "helix", and is even spoken of as tho it were not a rake angle at all.

While on the subject of rake angles, it is also advisable to discuss the matter of "corner angle", also called the "lead angle". The term "corner angle" seems to be preferred because it is actually the angle on the corner of a face mill and tells us something about the actual rake or "true rake" at the cutting edge, because the true rake is measured in a plane perpendicular to the surface momentarily generated by the cutting edge. A chip is formed in a direction approximately normal to the cutting edge which produces it. Therefore, this corner angle is extremely important. With a zero corner angle, for example, the chip is being formed in a direction toward the center of the cutter. Therefore, the true rake angle in this case corresponds to the radial rake of the cutter. As the corner angle is increased from zero to say 45 degrees, it is

---

*Manager, Engineering Service Dept., The Cincinnati Milling Machine Co., Cincinnati (9) Ohio.

**—See Page 161, July issue of The Machine Tool Blue Book.

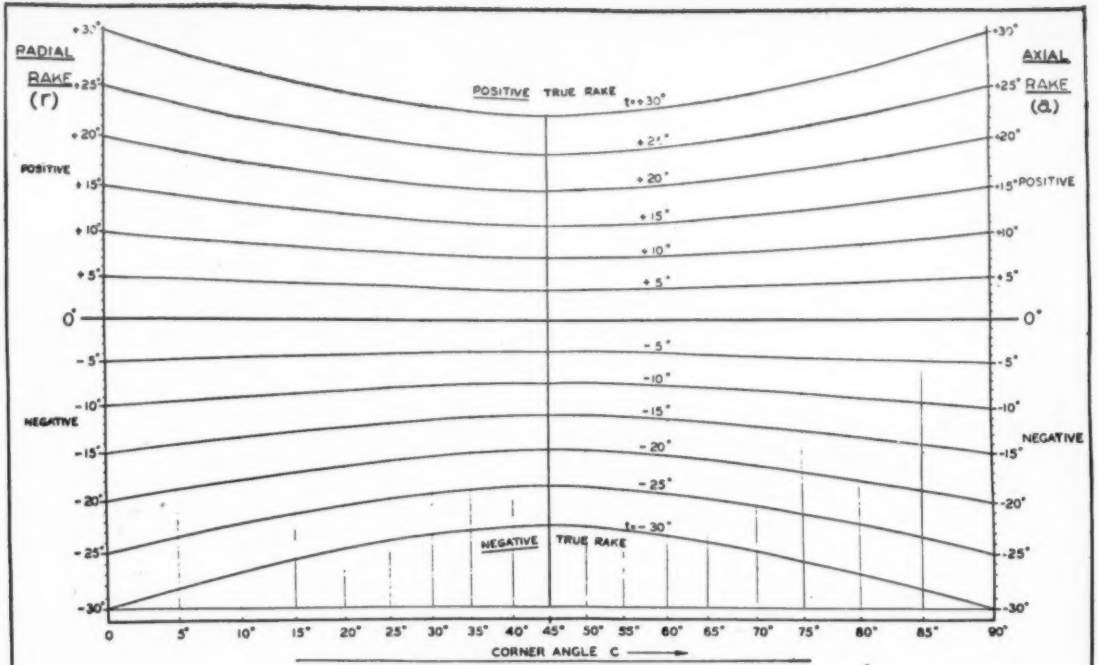


The Smaller the Hole
The More Important is
PRECISION DRILLING

Holes from .004 to 5/16" diameter are drilled with uncanny precision. Ideal for instrument panels, aircraft and Diesel work . . . wherever accuracy looms large for tiny holes.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

The HAMILTON MUEHLMATT
Super Sensitive
DRILLING MACHINE



ALIGNMENT CHART FOR TRUE RAKE t:

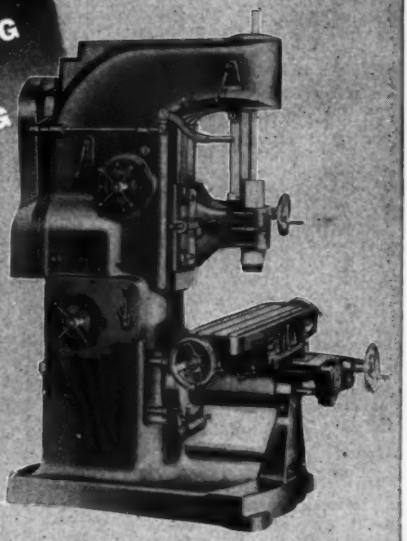
$\tan t = \tan r \cos c + \tan a \sin c$

Fig. 1.

The KNIGHT MILLER No. 40

Performs . . .
FIVE OPERATIONS AT ONE SETTING

- BORING
- MILLING
- SLOTTING
- PROFILING
- KEYWAY CUTTING



This milling machine will perform and accurately produce to full capacity at all speeds and feeds. Here are some of the ways that the KNIGHT MILLER can save you valuable hours on many jobs. Equipped with a special swivel and tilting table that saves the use of angle plates, cutters and special fixtures. The No. 40 has a wide range of capacity fitting it for many jobs and uses. There are 16 different spindle speeds and 16 different table feeds available.

WRITE FOR FOLDER

W.B. KNIGHT MACHINERY CO.
3924 W. PINE ST. ST. LOUIS, MO.

RESPONSIVE TOOL FOR FUSSY JOBS

Every toolroom is confronted with a succession of small but extremely important jobs such as die work, model and metal patterns, jigs, fixtures, boring, reaming, drilling, etc. Too often they are scheduled on heavy, high-capacity machines . . a slow and costly procedure. The answer? . . install a LINLEY.



FEATURES: 8 speeds to 4250 r.p.m., table size 7" x 17½", floor space 18½"x20", velvet feed, micrometer screw head, no backlash in quill travel, grease-sealed bearings; saves time in set-up, easy changeover.

The LINLEY is a precision machine in all respects . . . a fast worker on fussy jobs . . . an investment that pays substantial dividends.

BULLETIN ON REQUEST

LINLEY BROS. CO

663 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

apparent that the chip no longer is formed toward the center of the cutter, but in this case is being formed in a direction away from the surface being milled, the angle of its inclination being approximately normal to the corner angle, and therefore dependent upon the amount of this corner angle.

The true rake, therefore, is dependent upon both the radial rake and the axial rake; and it is the combination of the radial rake and the axial rake and the corner angle which determines the true rake of the cutting edge of the tool. One component rake angle might be negative, while the other component rake angle might be positive, and still we can have either a negative or positive true rake angle dependent upon the corner angle. The mathematical relationship between these angles was developed by Dr. Kronenberg of the Research Department of The Cincinnati Milling Machine Co., and presented in a paper delivered before the ASME in November 1943. (See Fig. 1).

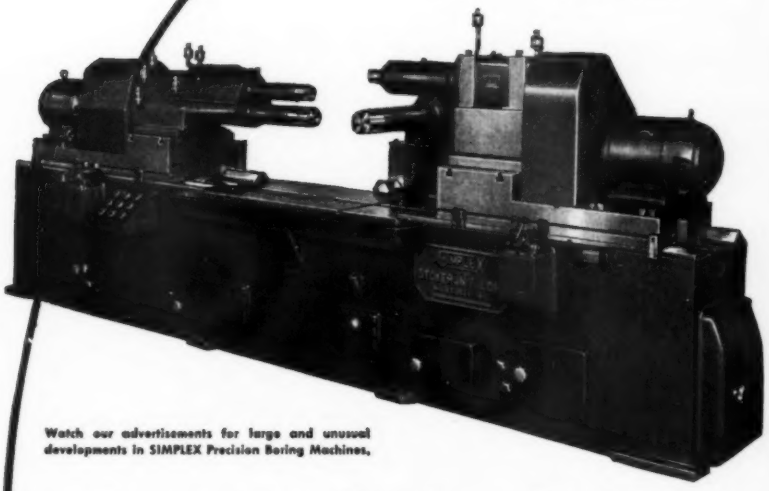
It is not necessary that both radial rake and axial rake be negative to be successful in the milling of steel and its alloys, but it is important that the true rake at the cutting edge be negative regardless of whether the radial rake, for example, be negative or positive as long as its combination with the axial rake angle and the corner angle gives us the negative true rake angle at the cutting edge.

We have seen some very successful carbide milling operations in steel where a very high negative axial rake angle was used and a positive radial rake angle was employed in combination with a 30-degree corner angle. True enough, the true rake angle was negative, and that is the important feature of this method of milling. Ordinarily, this high negative axial rake angle and the positive radial rake angle are not to be recommended because of their tendency to cause the chips to be formed within the hollow on the end face of the face milling cutter; but if only three or four teeth are used on such a cutter, there is generally ample opportunity for these chips to escape without causing any damage.

SIMPLEX

When a leading tractor manufacturer contracted to build a transmission for a military tractor, they realized they could not take any chances with Government inspection. A SIMPLEX 3U 3-way Precision Boring Machine, large enough to bore a unit 4' long, made a quick and easy job of getting them out swiftly — and right!

The transmission case was approximately rectangular, 48" long, 19" wide and 21" high. There were six bores, ranging from 2¾" to 6½". Most of them were located so deep in the casting that extension type spindle heads were necessary. With this arrangement there was very little tool overhang, accuracy was easily maintained, tool life increased, chatter avoided.



Watch our advertisements for large and unusual developments in SIMPLEX Precision Boring Machines.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4530 West Mitchell Street, Milwaukee 14, Wisconsin

MERGED!



Tungsten Carbide and Diamonds in Westcoast Diamond tools

Tungsten Carbide and Diamonds have been united to produce new, fast-cutting, economical dressers. Westcoast Tungsten Carbide strip Dressers ideal for straight dressing; Tungsten Carbide Cluster Dressers unsurpassed for radius dressing. Now ready to go to work in your plant.

Also available—large stocks of BORTZ, BALLAS, POINTS, POWDER—all sizes and qualities.



24-HOUR RESETTING SERVICE!

FOR SIZES, STYLES, PRICES—FULLY ILLUSTRATED CATALOG, MTBB-10, MAILED ON REQUEST.

25 YEARS' EXPERIENCE

WESTCOAST DIAMOND TOOL CO.

11601 WILSHIRE BLVD., LOS ANGELES 25, CALIF.

Telephone: ARizona 3-3147

The real reason for using negative angles instead of positive angles in the carbide milling of steel is that the negative angle very definitely gives us a much stronger tooth section at the cutting edge than the positive angle, and because of this increased strength it makes possible the milling of steel with long cutter life between grinds, etc. Another reason for the use of negative rake angles is that the initial impact between the cutting tooth and the work piece at the start of the chip is quite apt to be imposed upon the tooth face some distance back of the cutting edge. This is especially likely to happen in the use of face milling cutters. We cannot agree with Dr. Frommelt's statement, however, that "the pressure of the cut with the negative angle is applied to the tip away from the cutting edge an amount approximately equal to the chip thickness", and do not believe that this gives us an accurate understanding of the merits of negative rake.

The statement has been made in the paper under discussion that friction and abrasion are carbide's worst enemies and that the use of peripheral cut speeds ranging from 500 to 1000 feet per minute apparently lessens the abrasive effect of the carbide tip while in the work. From the work which has been conducted so far, we feel quite definitely that friction between the chips as they are produced and the face of the cutting tooth is considerably reduced at the higher cut speeds; and it would follow, therefore, that abrasion also is likely to be reduced considerably at these higher cut speeds.

There are, however, other so-called worst enemies of carbide, and I should like to take the opportunity of pointing out that in our opinion the worst enemy of all is the improper preparation of the tool for cutting. By this I mean grinding the cutter with coarse grit wheels exerting high pressure between the grinding wheel and the cutting tool; failure to keep a clean open face on the grinding wheel, and finally by a general careless handling of the carbide cutting tool after it has been thus hastily ground. To obtain long cutting tool life, it is essential that the cutting edges be prepared very carefully and in a good workman-like man-



GRINDING 45% FASTER

This Ohio foundry was cleaning flat surfaces and fillets of winch frame castings with straight type 6" air grinders. Men and tools couldn't "keep up." So they asked the Rotor Application Engineer for a bottleneck breaker:

"This job requires a tool that is speedy on the curves as well as the straight-of-way," said the R.A.E. "The *right tool* is a Rotor Vertical Grinder with a 6" flared cup wheel." It got this result:

Production boosted 45%
Bottleneck broken

The R.A.E. would be glad to survey *your* portable tool operations with a similar objective in mind. No obligation.

Yours for the *right tool,*

AIR O'TOOL



THE ROTOR TOOL CO.
CLEVELAND OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



ner. We do not know exactly what happens to the carbide when it is roughed off in a hurry with a coarse grit grinding wheel, but we do know that the results obtained from such procedure definitely show us that we cannot expect long tool life between grinds and that, therefore, we must resort to the more careful and slow method of grinding, preferably with a diamond impregnated grinding wheel. In one particular case of hexagon milling an acorn nut of mild steel, the number of pieces between grinds was increased from an average of 200 pieces to over 300 pieces, merely by exercising greater care in grinding, while using the same cutters.

We are all acquainted with the fact that considerable heat is produced by the High Speed Carbide Milling of Steel with negative rake cutting tools. Most of this heat passes away with the chips. Extensive tests have shown that the forces on the cutting tooth face are reduced considerably at the higher cut speeds; and we feel that this is quite likely due to the fact that the surface of the chip to the depth of a few molecules is reduced to a semi-molten state, with the net result that the friction between the chip and the face of the cutting tooth is reduced considerably, with a consequent lowered force on the cutting tooth face.

Figures 2 and 3 are photomicrographs of cross sections of chips made with face milling cutters having, respectively, 10 degrees positive and 10 degrees negative true rake. In each case, the cutting speed was 1180 feet per minute and the feed increment f, normal to the surface generated by the cutting edge, was .004". From these photomicrographs it is evident that the mechanism of chip formation here is essentially the same for both the positive and negative rake cutters. In each case the chip contacts the tool face at the cutting edge.

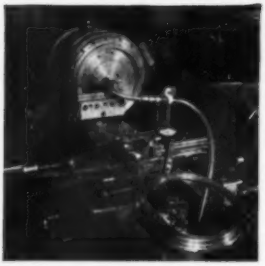
From time to time an effort has been made to set up some given rule whereby a quick calculation of the number of teeth in a cutter can be established. The "rule of thumb" method suggested in

NEW AND REVOLUTIONARY

MAGNETIC CHUCKS

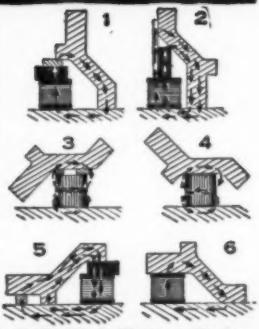
FOR

TOOL ROOM AND PRODUCTION



Following the arrows will quickly show how you may utilize the new Magnetic Circuit of our ➡ POWER-GRIP Chuck on surface grinders. The combinations of blocking, shimming, etc. are only limited by the operators experience and imagination. The holding power lost through the various blocks is negligible.

⬅ On a 10" Cast Iron ring, at Detroit—"We are pleased to say this has meant a 300% increase in production and a 5% decrease in scrap to this item." Square Tool, Die & Mfg. Co., (signed) W. Jackson, Factory Manager.



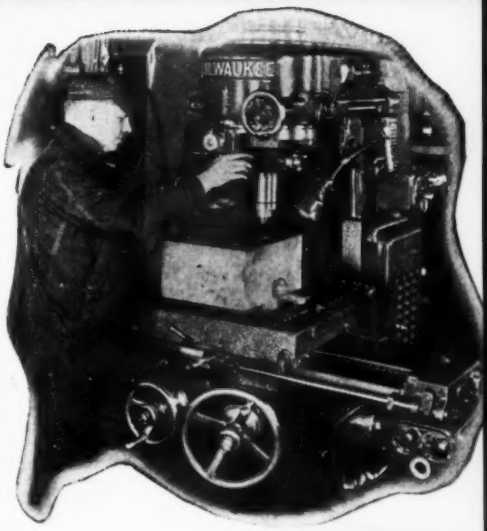
Furnished complete with combination Power and Control Unit for 110 Volt A.C. Circuits from stock.

ROCKFORD MAGNETIC PRODUCTS CO.

1018 Sixth Avenue — Card Brings Catalog — ROCKFORD, ILL.

MAINE STEEL, INC. *Reports . . .*

"Greatest Time and Money Saver in Die-sinking Machinery in 25 Years!"



"You may remember that about a year ago you sold us a Rotary Head Die-Sinking Machine. We feel that it is time that we told you what we think of it.

The Rotary Head principle has saved us more time and money than any other improvement in Die-Sinking Machinery since Cherrying Attachments were invented more than twenty-five years ago.

The principal reason is that we can sink four (4) impressions complete without moving the work on the table.

This saves three (3) setups out of four (4) when compared to a Rotary Table Machine.

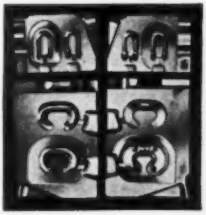
This saving would of course be increased where more than four (4) impressions are needed.

Besides this — the various movements built into this Rotary Head enable us to sink our dies without first laying them out on the Die Blocks.

The machine does its own layout work.

And after a year's experience we can say that these two features have averaged to save us over 30% of our die-sinking time.

Yours very truly,
MAINE STEEL, INC.
A. A. Rines
Foreman—Die Sinking Dept. "



This is typical of the forging dies produced by Maine Steel, Inc. The Milwaukee Rotary Head Miller has saved this firm over 30% in die-sinking time on dies of this type.

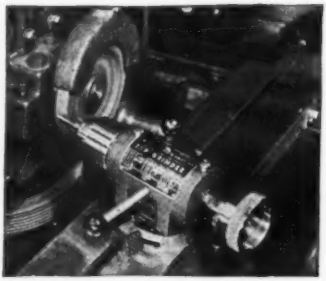
Kearney & Trecker's Rotary Head Miller is regarded by the majority of users as the most versatile machine ever designed for die and mold work. Direct — fast — accurate — it reduces initial job preparation and set-up time to the minimum—saves operator's time and assures rapid production of dies and molds. Write for Bulletin No. 1002C for full information on this unusual machine tool.

Rotary Head Milling Machine
Autometric Jig Borers
Center Scope

Kearney & Trecker Products
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
Milwaukee Midgetmill
Milwaukee Speedmill

Makes Old Taps Cut Like New!



READING TAP GRINDER

Can be used on almost any type of tool and cutter grinder, surface grinder — even bench lathes. Tap is held in chuck — may be sharpened after center is destroyed. **No collets.** Complete. No extras. Write!

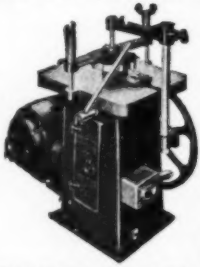
- Built-in chamfer protractor.
- Simple shifter for 2-3-4 flute taps.
- Variable relief thru adjustment screw.
- Easy - to - follow chamfer diagram on index plate.
- Capacity to ¾" hand tap.

ORDER NOW!

★ ★ ★

Also manufacturers of

READING BROACH KEYSEATER



The Reading Bench Machine does not require bushings or guides. No other machine like it. Very fast capacity from ⅛ to ⅜ cutter. Low first cost — prompt delivery.

READING MACHINE CO.

READING (CINCINNATI), OHIO



the paper, that the number of teeth in the cutter be made equal to the diameter of the cutter in inches plus 2 is a little too elementary and apt to lead to disastrous and very disappointing results. The use of carbide cutters for the milling of steel should be encouraged by every possible means, because it represents one of the greatest advances in milling that has been made in the last decade. To treat the very important subject of the



Ideas FOR DESIGN-ENGINEERS—IN THESE USES OF *S.S.White Flexible Shafts*

ONE OF A SERIES showing typical POWER DRIVE and REMOTE CONTROL applications

POWER DRIVE COUPLING

A short length of power drive flexible shaft makes an efficient drive coupling. In the gas-fired forced-air heater shown, it couples motor to blower. Note how close together it allows the two units to be placed—something to remember particularly when you're up against a problem of limited space.

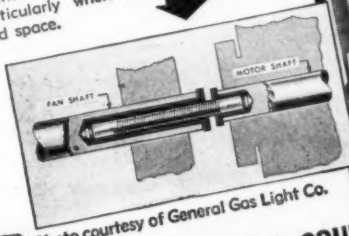


Photo courtesy of General Gas Light Co.

REMOTE CONTROL COUPLING

Short lengths of remote control flexible shafting can be used to great advantage in radios, electronic equipment, stoves, ranges, etc. for bringing control knobs and dials to positions on the equipment where they will be convenient to operate. This is illustrated by the oil heater shown. The dotted line indicates the flexible shaft coupling the calibrated dial to the oil and air supply control.



Photo courtesy Quaker Mfg. Co.

KNOW THE RANGE AND SCOPE OF S. S. WHITE FLEXIBLE SHAFTS

Tables of basic data on power drive and remote control shafts are given in BULLETIN 43. A copy will be mailed on request. Write for yours today.

S.S.WHITE INDUSTRIAL DIVISION

THE S. S. WHITE DENTAL MFG. CO. DEPT. H 10 EAST 40th ST., NEW YORK 16, N. Y.

FLEXIBLE SHAFTS AIRCRAFT ACCESSORIES
MOLDED PLASTICS
MOLDED RESISTORS FLEXIBLE SHAFT TOOLS



recommended number of teeth in a cutter so lightly might very easily lead to great disappointment on the part of some enterprising tool engineers. They might possibly feel the carbide milling of steel is something that has as yet been developed to the point where it is applicable only to a very few and limited types of work pieces. The suggestion is made, therefore, that we might profitably calculate the number of teeth which should be provided in the cutter from the horsepower available on the machine which is to perform the milling operation; the feed per tooth which is most desired for the material to be cut; the peripheral cutting speeds which are most desired for the material to be cut; the depth of cut; the width of cut, and finally by the cutting qualities of the material as determined by the horsepower required to remove a cubic inch of this material per minute. With these factors a very simple equation can be arrived at and expressed thus:

$$\text{Number of teeth} = \frac{HP}{K\,D\,F\,W\,N}$$

HP = Horsepower of machine;
K = Horsepower required to remove a cubic inch of material per minute;
D = Depth of cut;
F = Feed per tooth in inches;
W = Width of cut in inches;
N = RPM of cutter.

In this equation, it is essential, of course, that some effort be made to determine the value of factor K in advance. This, however, can very easily be done by making an initial test cut which is known to be safe for the power available in the machine upon which the job is to be milled and using this value in the formula given. In general, for very mild steels, factor K may have a value of 1, whereas in some of the tougher alloy steels its value may be as high as 1.4. These values, of course, are for cutters which are in good operating condition, and some allowance preferably should be made for the possibility of greater power being required under conditions which prevail when the cutter becomes somewhat dull.

EX-CELL-O

Ex-Cell-O Precision Grinding Spindles, fitted with Ex-Cell-O ball bearings specially developed for fast, accurate work, permit high finish in original grinding — often eliminating subsequent lapping and polishing. For complete information and specifications of Ex-Cell-O Precision Spindles, write for Catalog S-537.



EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

XLO

EX-CELL-O *for* PRECISION

Precision MACHINE TOOLS • CUTTING TOOLS • AIRCRAFT AND MISCELLANEOUS PARTS

OLIVER OF ADRIAN



DIE MAKING MACHINES

The cut illustrates an Oliver in the plant of the Magheliese Tool & Die Co.

"They find it the most efficient and practical machine for the purpose."

The Oliver is fast and efficient on all sawing, filing and lapping operations on Dies, Templates, Gages, cams, stripper plates, etc.

They save 50 to 60% of the labor over hand methods.

Equally efficient on production filing jobs.

Send for literature describing the line of Oliver Die Making Machines!

•

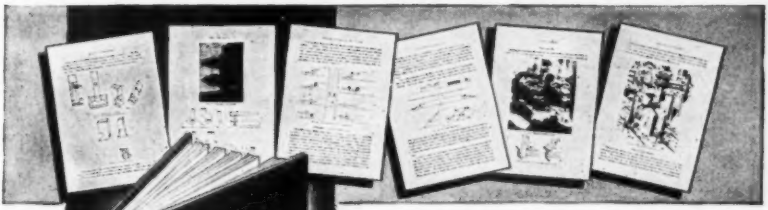
OLIVER INSTRUMENT COMPANY
1408 Maumee St., E. Adrian, Mich.

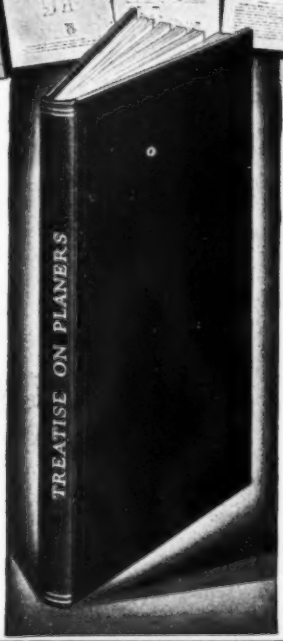
We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

Flywheels provide the momentum required to insure a steady and vibrationless flow of power to the cutter, and thus eliminate the vibration which generally has its inception in the cutter itself due to the variation in contacts between the cutter and the work piece when one cutting tooth leaves the work piece and later on, another cutter tooth enters the work piece, etc. It is quite obvious that the flywheel will be most effective when applied as close to the cutter as possible. This explains some of the very successful installations that have been made on standard milling machines, designed and built before there was any thought of ultimately using them on High Speed Carbide Milling of Steel. A number of data sheets supplied by the War Production Board Office of Production Research and Development have illustrated milling machine setups using flywheels mounted directly upon the arbor with a gang of Carbide milling cutters. The most effective spot for the application of the flywheel is either on the spindle of the machine or on the arbor itself. In all cases, to obtain the maximum benefits from this flywheel, the point of application should be as close as possible to the cutting action. It is true that a flywheel mounted at the rear end of a horizontal spindle of a milling machine or at the top end of the spindle of a vertical milling machine helps considerably, but the maximum benefit can be obtained when the flywheel is mounted as close as possible to the place where the cutting takes place.

Without the flywheel or an equivalent massive gear on the spindle, it is doubtful if satisfactory results on a wide range of Carbide milling applications can be obtained. In fact, some of the observations which we have made indicate that in general, we might expect only about 50% of the cutter life between grinds from a setup in which a flywheel is not employed as compared with a corresponding setup on the same type of work with the same type of cutter, etc., but with the flywheel.

Based on material presented in a symposium on Carbide Milling of Steel at the Ninth Westinghouse Machine Tool Forum at Pittsburgh.





LEARN PLANING THE HYPRO WAY

Just Off the Press 1944 Treatise on Planers

● This 134 page, cloth bound and handsomely illustrated book is equally useful to the planer operator and those responsible for high production.

● Its pages are full of suggestions that you can profitably apply in your shop. The Treatise is yours for $1 postpaid. If abroad please enclose international money order.

THE CINCINNATI PLANER CO...CINCINNATI, OHIO

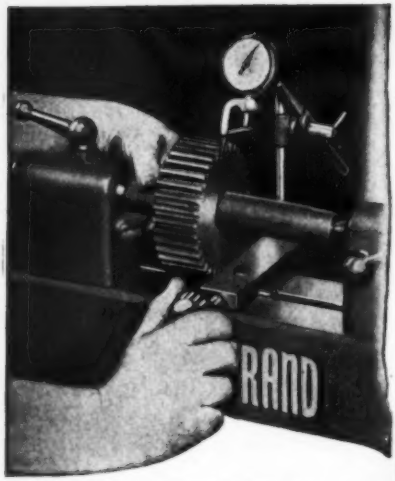
THE CINCINNATI PLANER CO.
Forrer and B. & O. R. R., Cincinnati 9, Ohio

Attached is one dollar for which I am to receive a copy of the 1944 edition of the "Treatise on Planers".

Name..... Title.....

Company..... Zone.....

Street..... City..... State.....



(Above) Checking runout on gear. Work is mounted between centers and rotated with one hand. Indicator clamp stand is controlled by operator's free hand as shown.

HOW "One-Hand Control" Speeds Precision Checking

Runout Checked to Within .0001" Limits on Sundstrand Bench Centers



(Above) Sundstrand Bench Center showing standard parts.

USING one hand to control all moving elements on the Sundstrand Bench Center, the operator's other hand is free to control the part being checked. The indicator support is easily controlled with one hand. It is moved away from the work when loading and unloading, and against the work for checking runout.

For rapid loading and unloading, the spring loaded center can be quickly clamped and unclamped by using headstock center clamp. After unclamping, the center is retracted by slight hand pressure on the center retractor lever.

Either headstock or tailstock can be unclamped, positioned and reclamped by one hand using the headstock or tailstock top lever clamps.

These easy and simple operating features speed checking for runout. Shoulders, faces or variations from true circular form on work such as gears, sprockets, shafts, pinions, or practically any parts which can be rotated between centers, may be checked on this Bench Center. Here is a practical addition to your tool room, production or inspection department.

Range of Sizes:

6" x 18"	12" x 36"	12" x 60"
6" x 36"	12" x 48"	12" x 72"

SUNDSTRAND MACHINE TOOL CO.

Rigidmills • Fluid-Servo Rigidmills • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

SOME BRAZING TIPS

By LAWRENCE D. JENNINGS*

BRAZING is a metals-joining process wherein the filler metal is a non-ferrous metal, or alloy whose melting point is higher than 1000° F but lower than that of the base metals or alloys being joined. Its simplicity, and economy, along with the strength, ductility, electrical conductivity and non-corrosiveness of the resulting joints has encouraged industry to adopt it as the preferred way of joining metals where the part is too intricate for forging, too small or of unfavorable composition for welding, where liquid or pressure tightness is required and for electrical connections.

Brazing is a relatively simple operation, requiring but a short time to train an operator for the average job. It consists of cleaning the parts to be brazed, fluxing the joint, heating the parts to a brazing temperature, adding the brazing material and allowing the assembled parts to cool as a homogeneous unit.

Economy

The universal adoption of brazing is excellent proof that this method of metals-joining offers economy to the user. The small amount of equipment necessary, its adaptability particularly to precision machined parts, and the simplicity of the operation all lead to reduced costs.

Strength

The brazed joints have high strength because the high fluidity of the brazing material at the correct brazing temperature, along with the capillary action of the fluid brazing alloy between the closely fitted parts, penetrates and covers the entire surface of the joint. There is sufficient diffusion and alloying with the metal surfaces to make a high strength bond which will give joint efficiencies between 90 and 98 per cent of the base metal.

*Westinghouse Electric & Mfg. Co., Sharon, Pa.

Ductility

The brazed joint has good ductile properties, with the silver alloy solders ranking first. The thin joints may be cold worked into thin sheets or fine wires. They withstand severe shock, vibration, and temperature changes.

Conductivity

The high conductivity of brazed joints has led to adoption by the electrical industry. Butt-brazed joints in copper conductors have 98 to 99 per cent of the conductivity of the copper, while lap joints have 102 to 104 per cent of the conductivity because of the increased section at the joint.



Fig. 1—Machine brazing a furnace transformer winding using carbon resistance blocks and hand feeding the brazing alloy

THE Right MACHINE THE Right FIXTURE

AIR CONTROL is the Secret of precision tapping The Haskins Way

Accuracy—to a class 4 fit when necessary—is constant—each part is tapped exactly like every other, independent of operator efficiency. AIR regulates the complete tapping cycle—not only the down stroke, but its control is so sensitive that the tap is allowed, in effect, to float out of the part. Tap life is longer—tap breakage practically eliminated. Send today for your copy of catalog on Tapping—The Haskins Way. R. G. Haskins Co., 624 So. California Ave., Chicago, Illinois.



haskins
PRECISION TAPPING EQUIPMENT

Corrosion

Since the brazing alloys are of copper or copper-silver, they possess high non-corrosive properties and the brazed joint is corrosion resistant.



Fig. 2—Brazing copper wire to copper terminals. The pre-placed brazing material is heated by resistance of the joint and the conducted heat from Molybdenum tips.

Types of Joints

Proper design is the result of correct joint selection along with the required tolerances. There are three types of joints in general use—the butt, the scarf, and the lap. The **butt** joint is used where the joint thickness cannot be greater than the thickest single member. It is somewhat more difficult to make than scarf and lap joints because the ends must be machined squarely and the fit-up must be perfect. Thickness of the joint should be .002" for maximum strength and in no case greater than .005" for good results. The joint, when properly made, will be nearly as strong as the parent metal but will decrease the electrical conductivity slightly.

The **scarf** joint is a modification of the butt joint in that the joining surfaces



GREATER WEAR RESISTANCE

LONGER CUTTING LIFE

LOW IN COST

REAMER BLADES that are—longer wearing, harder, tougher, better cutting—those are the results of Wetmore REAM-MOR processing.

These new blades were developed through long research and experimental work done by Wetmore metallurgists and engineers, in the laboratory, plant and field. They are the product of broad reamer experience and a desire to create an economical high speed steel blade specially processed, that would have the wear resistant qualities of "premium" alloys.

Developed by a reamer manufacturer especially for better, low cost reaming, Wetmore REAM-MOR Blades are another example of Wetmore Quality Tool Service. Available for all model Wetmore Reamers—why not try a set and increase production, reduce grinding—and lower blade costs.

Send for the New REAM-MOR blade bulletin for complete details.

WETMORE REAMER CO.

414 North 27th Street, Milwaukee 8, Wis.

WETMORE REAMERS BORING BARS

"BEATEN PATHS ARE FOR BEATEN MEN"



MIGHTY text for a postwar industrial sermon is that given by Eric Johnston . . . "Beaten Paths are for Beaten Men."

Anyone who has followed, even casually, his able leadership of the U. S. Chamber of Commerce will sense that his fight is for men who can change over from business procedures that simply ECHO, to those that SHOUT!

The trouble is that, to many, complete changeover from the beaten path presents many unknowns which cause hesitation.

But, there is a painless and known way to blaze the trail . . .

—exemplified by men who, through Recourse to Arc Welding, changed over our ship construction technique and beat the beaten path method 10 to 1 . . .

—and on other war-machine items, beat it as much as 50 to 1 . . .

—the PROVE-AS-YOU-GO plan, one item at a time:

"Beaten Paths are for Beaten Men," *says Eric Johnston*

Look, Mr. Johnston, how through recourse to Arc Welding, changeover by degrees makes the unbeaten path safe and easy traveling. You not only can PROVE as you go, by weldesigning one part at a time, but IMPROVE as you go, as in the case of this frame for a trencher digging wheel:

Step at a time departure from the beaten path:



The Starting Point. Conventional steel construction. Scrap loss was high. Frequently broke in service.

First Step. Composite of conventional construction with welded-in steel shaft. Breakages eliminated.

Second Step. All welded steel construction. Superior performance. Cost cut 30% from starting point.

[This is one of a number of changeovers discussed in the current series of Lincoln Machine Design Studies. Free to engineers and designers.]

THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

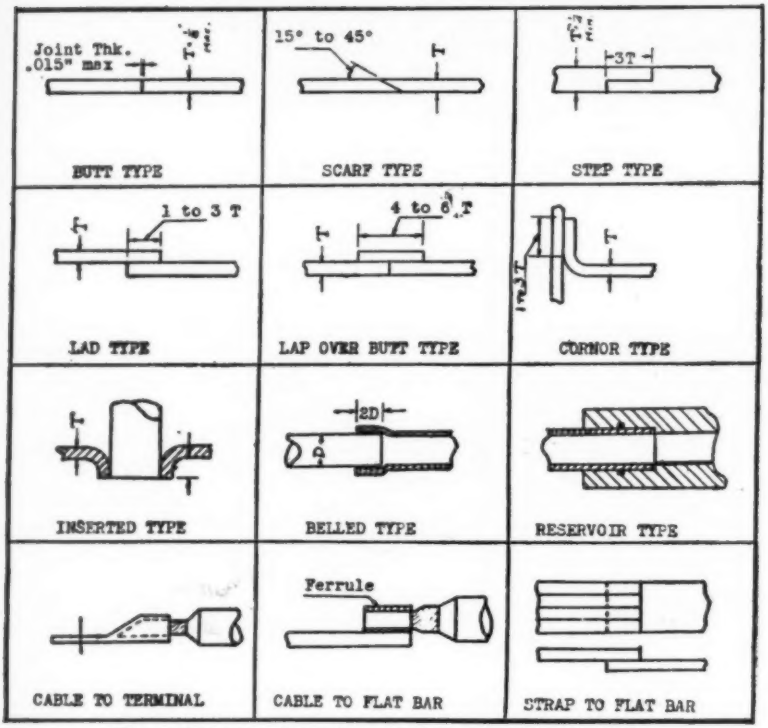
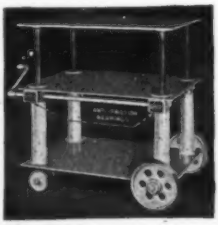


Fig. 5—Presenting the various common types of brazed joints.

are butted at some angle less than 90°. A 45° angle is usually selected. The overall dimensions of the joint are equivalent to the parent members, the strength is comparable to the conventional butt joint, the joint is more ductile, and the elec-



Do It Mechanically . . . Save Production Costs

PORTELVATOR (Portable Elevating Table)

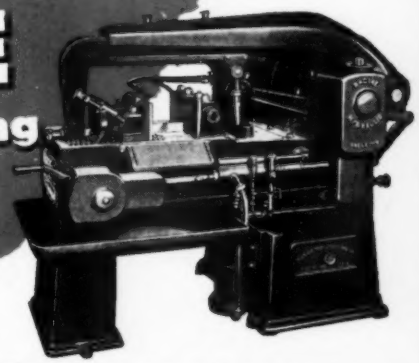
Run 'er all over the plant . . . let PORTELVATOR do cheaply what man-power does on high hourly rates. Use it for carrying, as work bench, for overhanging work, for lifting, etc.

Capacity up to 20 tons

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

THE PRODUCTION SAWS
OF MODERN INDUSTRY

RACINE
metal cutting saws . . .



Model 30-C—Hydraulic Production Saw

HYDRAULIC OPERATION

In these Racine Heavy Duty Production Machines, all of the operating functions except reciprocating the saw frame, are accomplished with hydraulic pressure.

This is one of the reasons Racine Machines are fast and accurate. They stand up in heavy duty service with a minimum of maintenance expense.

For the past 36 years, Racine has pioneered improvements in the design and productive capacity of metal cutting machines.

Positive progressive feed, hydraulic operation and control, dual feed and other advances were first used by Racine. These features in Racine Machines assure you high production, accurate work, long blade life; a lower cost per cut.

Racine Machines are available in various models designed for maintenance and tool room work as well as heavy production runs. Cut all classes of material. Capacities range from 6" x 6" to 20" x 20".

Our Catalog No. 12 contains a short summary description of the entire Racine line. May we send you a copy?

RACINE OIL HYDRAULIC PUMPS AND VALVES

Catalog P-10-C outlines all the features of Racine "Variable Volume" Pumps, Valves and Controls. Pumps in capacities of 12-20-30 g.p.m. They operate at 50 to 1000 lbs. p.s.i. Valves from 3/8" to 1 1/4". Write for the catalog now.



RACINE
TOOL and MACHINE COMPANY
Standard for Quality and Precision
RACINE, WISCONSIN, U. S. A.

GIRLS CAN OPERATE

NEW Rouse
HAND MILLER
FOR SMALL PARTS

$98
(Without Fixtures)
F. O. B. Chicago
Motor Extra



One of the ROUSE Fixture Set-Ups that Speed Production

The Rouse Hand Miller is a versatile, efficient, high-speed ball bearing machine for handling light cuts in brass, aluminum and steel.

Rouse Fixture Set-Ups make the Rouse Hand Miller readily adaptable for accurately milling small parts for planes, radios, electric motors, and similar equipment. Spindle will take milling cutters or end mills.

Prompt delivery can be made. Send for circular.

H. B. ROUSE & COMPANY
2214 N. Wayne Ave., Chicago 14, Illinois

trical conductivity is somewhat greater.

The lap or shear type joint is the one most universally used because of its simplicity and because a safety factor may be incorporated in the joint by varying the amount of lap. The lapped areas should fit flat upon each other without applying pressure during the brazing operation. The amount of lap is determined by the safety factor desired and may be from one to three times the width of the narrowest number. Lapped joints have strengths as great as, or greater than the joined members and the electrical conductivity is greater because of the increased section at the joint.

Brazing Alloys

The selection of the brazing alloy depends upon the base metal being joined, the type of joint and the method of application. One may choose from a number of silver-copper alloys (silver solder) the one that will flow at the desired temperature and produce the necessary strength. These alloys are suitable for joining steels, copper and copper alloys. The phos-copper alloys are preferred for joining copper to copper because the phosphorous acts as the fluxing agent. They will not braze steel parts. Flow temperature is slightly higher than that of silver solders generally used and they are less expensive alloys.

Pure copper makes an excellent brazing alloy for steel parts where high joint strength is required, and the high brazing temperatures may be obtained, yet not affect the physical properties of the assembly.

The form of the alloy selected will be governed by the joint design and the method of application. There are three methods of application—hand feeding, preplacing the alloy in or around the joint, and the use of pre-filled reservoirs. Rods or strips are used for hand feeding, the size of which is determined by the size of the joint and the assembly so that it will melt quickly, give sufficient material to the joint and not require too great a length of rod or strip.

Too small a rod will require a long "feed-in", resulting in increased labor and the use of higher priced materials. A

For Smoother Performance



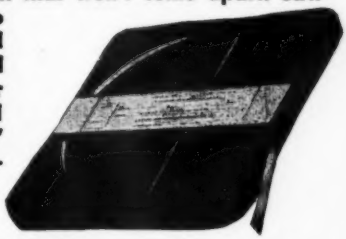
USE ATLANTIC Contour Cutting BAND SAW BLADES

You will welcome Atlantic Band Saws in your shop. The teeth are set to permit a smoother performance for radius cutting. The special alloy steel insures longer wear *and* you can weld them easily.

IMPROVED PACKAGE

One of the strongest, most practical and convenient boxes on the market. Cutaway feature shows inventory at a glance.

Box is solid chipboard construction that won't come apart. Saw securely held in coil form, no bothersome wires to cut. Required lengths freely removable. Marked on end as well as top of box for easy identification. Packed in all widths 3/32" to 1/2" wide in 100' lengths. Number of teeth as permitted by W. P. B. ruling.



Send for Atlantic Band Saw Booklet

ATLANTIC SAW MFG. CO., Inc.

Manufacturers of Metal Cutting Band Saw Blades Exclusively

153 Brewery St., New Haven, Conn.



Fig. 3—Brazing the internal connections of a transformer using carbon resistance blocks in portable tongs.

fill-in rod that is too large will require excessive heat or melting time and will usually apply excessive material to the joint.

Pre-placing the alloy has advantages on repetitive parts since it prevents waste of costly brazing material and tends to control the brazing time. The alloy may be pre-placed as inserts of thin sheets, flat washers, or rings of round or special



Gage makers with a record of accomplishments!

Haines Gages have consistently met the exacting requirements of leading aircraft engine builders and instrument makers. Think about it today and remember for tomorrow as you tool-up for peacetime production. Make a 60-second inspection of our plant by writing for new bulletin. Send us your inquiries. Haines Gauge Company, 2301 W. Allegheny Ave., Philadelphia 32, Penna.

Haines
PRECISION GAGES
PLUG • RING • SNAP • FLUSH PIN • PROFILE • ETC.



ANNOUNCING A COMPLETE NEW LINE!

CENTRAL *Certified Accuracy* MICROMETERS

WRITE FOR CATALOG NO. 14

The entire line of individual Micrometers and complete sets illustrated and fully described. Write to The Central Tool Co., Auburn, R. I.



All frames forged of the finest special alloy steel • The new improved polished frame Micrometers available in 1" and 2" sizes • The new black enamel finish Micrometers available in all sizes from 1" to 6" • Also available with ratchet stop, lock nut and 10,000ths graduations and a full range of Metric Micrometers in addition to complete sets

Send For Illustrated Catalog Today!

•IMMEDIATE DELIVERY!

THE CENTRAL TOOL CO.

Micrometers of Certified Accuracy

AUBURN · · · RHODE ISLAND

Insure Drilling Accuracy with Universal Drill Bushings



Universal Drill Bushings save valuable tool drills. Super finished bores insure accuracy and unexcelled wearing qualities. All standard sizes available. Write for catalog.



Army Navy "E" Flag Two Stars | Fighter Plane Given by employees | 20% 70 Employees Bond de...

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

shaped wire; the surfaces may be sprinkled or painted with powder or they may be pre-tinned.

A groove or reservoir is often cut in tubular joints and pre-filled with brazing material. The size and location of the reservoir is determined by the joint and the position in which it is to be brazed. Joints having internal reservoirs may be heated in any position since the fluid brazing alloy will penetrate the entire joint because of capillary action. Joints with external reservoirs should be heated only in the vertical position with the reservoir at the top of the joint so the flow of the heated alloy is downward.

Cleaning

Cleaning is of prime importance and too much emphasis cannot be placed upon it. Trying to get by with improperly cleaned metal surfaces is the cause of most brazing troubles. To do consistently good work and to obtain satisfactory joints, the metal surfaces must be clean and free of all dirt, oil, grease, and oxides. Cleaning may be done mechanically or chemically.

Mechanical cleaning has the advantage that it may be done at the site of the brazing operation by wiping off the oil, grease, or dirt with a rag or waste and by removing the oxide film with abrasive cloth or similar abrasives. A fine file, wire brushing, or grit blasting is effective for cleaning. Chemical cleaning is more efficient than mechanical cleaning and is recommended wherever possible. The grease should be removed with any of a number of reliable solvents. Then the part is dipped into an acid solution suitable for the type of metal being cleaned, rinsed and dried quickly.

Fluxing

Fluxing has three important functions to perform:—(1) to protect the metals from oxidation while heating; (2) to dissolve any oxides that form; and (3) to assist the flow of the brazing alloy. The flux should be placed or brushed upon the work when heating begins, to prevent metallic oxides from forming during the heating cycle. It should melt and flow at a temperature below that of the brazing alloy so that it may assist the flow of the fluid brazing alloy.

Patented fluxes are recommended since

SPECIAL ASSIGNMENT

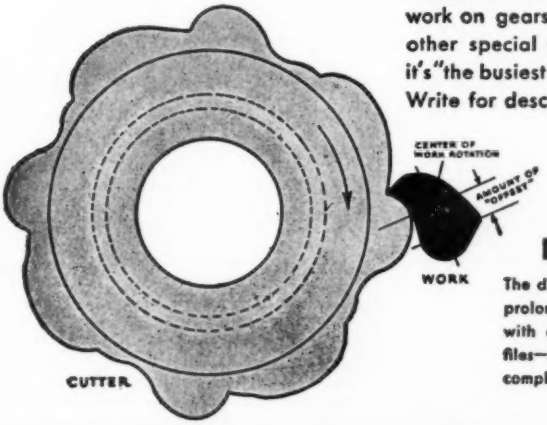
No. 3

for "the Busiest Machine in the Shop"



Machining an Irregular Cam

The striking **versatility** of the Fellows Gear Shaper cuts your costs on a wide variety of jobs.... Fellows can design a cutter to produce the exact form of any irregular-contour part, such as the one shown above. Accurate production at high speed is assured.... Remember, you use this cutter on the **Standard Gear Shaper.** Change cutters when the job is done, and the machine returns to work on gears, sprockets—or some other special contour. No wonder it's "the busiest machine in the shop." Write for descriptive bulletin.



HERE'S HOW

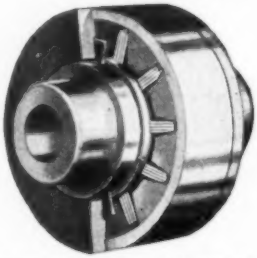
The design of this Fellows cutter prolongs cutter life, it is made with duplicate cam-cutting profiles—four pieces are cut at each complete revolution of the cutter.

THE **FELLOWS** GEAR SHAPER COMPANY

78 River St. Springfield, Vermont • 230 West Town Office Bldg., Cincinnati 2, Ohio • 616 Fisher Bldg., Detroit 2, Mich.

LOOK - - -

WHAT CUSHION TORQUE WILL DO FOR YOU



If you want steady, uninterrupted production — lower machine-repair costs and freedom from misalignment troubles, take advantage of the long-lived CUSHION TORQUE developed by the KANTI-LEVER COUPLING. It not only protects you against misalignment like the ordinary coupling, but it goes several steps further and cushions your Motors and Productive Machines against the wear, vibration and fatigue that are the source of most machine failures. No other coupling is like the —

Kanti-Lever Coupling

It has a circular series of laminated, resilient Cantilevers of 200,000 lb. steel operating in taper-side slots. End thrust is impossible: leverage on the cantilevers decreases automatically with increased load: safety stops prevent damage from extreme overloads: special end-float obtainable up to four inches without increase in cantilever stresses: outer periphery can be used as a brake drum for quick-stopping machinery. Over 3,000,000 H.P. in service.

Send for Bulletin No. 28-M.

BROWN ENGINEERING CO.

126 N. THIRD ST. READING, PA.

they have flow points between 800 and 1100° F which is below the 1175 to 1300° F melting point of silver solders in general use. Borax or borax acid fluxes may be used but they require temperatures of 1400° F or higher, which is considerably above the flow temperatures of silver-copper alloys. They will not dissolve chrome oxides.

The flux is usually mixed with water and brushed upon the surface to be brazed. The entire surface must be covered to insure a homogeneous joint free from pin holes and unbrazed areas. A clean surface is essential for complete flux coverage.



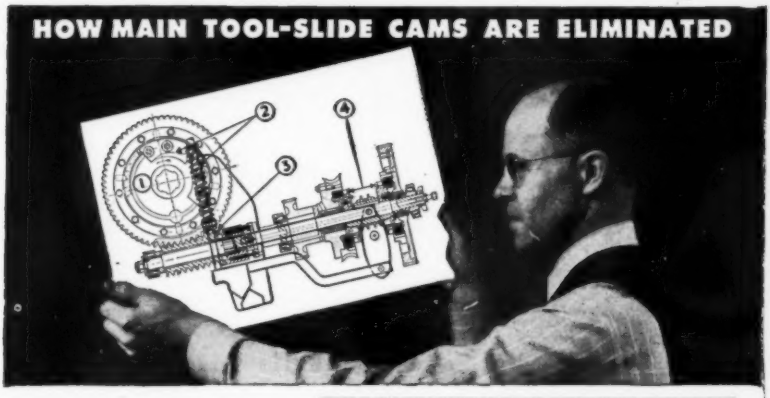
Fig. 4—Oxy-Acetylene torch brazing condenser bushing flanges.

Heating

There are several methods of heating parts to be brazed. Size, shape, quantity, and location of the items to be brazed determine selection of the method, such as gas, dip, electrical, or furnace heating.

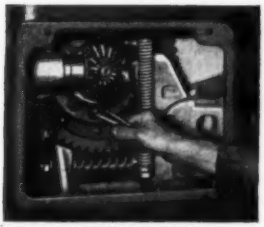
Gas heating is done by burning a combination of fuels such as oxy-acetylene, oxy-hydrogen, oxy-city gas, natural gas, butane, propane, air-acetylene and air-gas in a torch. Torch brazing gives best results when high Btu gases are used,

HOW MAIN TOOL-SLIDE CAMS ARE ELIMINATED

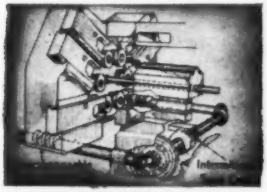


Drawing, with clutch assembly in black and shifting levers in color, shows graduated worm wheel (1); clutch shifting dogs (2); safety clutch (3) which automatically disengages in case of overloading or jamming; and duplex clutch (4).

GREENLEE® 6-SPINDLE AUTOMATICS



STROKE ADJUSTMENTS IN LESS THAN 5 MIN.
Main tool-slide feed stroke adjustments are quick and easy. Changes are made by adjusting only one dog on graduated worm wheel. Accurate, precise adjustments can be easily made in less than 5 minutes.



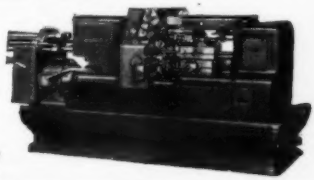
MAIN TOOL-SLIDE OPERATING MECHANISM
Sketch above shows the simple operating mechanism on the Greenlee Six. Sketch shows the intermittent feed gear mounted between the tool-slide ways, which engages a feed and return rack on tool-slide.

AUTOMATIC SHIFTING DEVICE ON CLUTCH SAVES SET-UP TIME — CUTS CAM COSTS

● By an exclusive design feature on Greenlee Screw Machines, main tool-slide cams are completely eliminated to effect obvious savings in cam costs. In addition, set-up time is reduced... less than 5 minutes is required to make precision feed stroke adjustments.

The Greenlee tool-slide operating mechanism is simple to understand and easy to adjust . . . offers practical aid for the inexperienced. Tool-slide makes full stroke each cycle . . . approaches fast . . . shifts smoothly into feed at point controlled by dog on worm wheel.

This is one of the exclusive time and cost-saving Greenlee features that makes for efficient production today on many short-run as well as long-run war jobs. Perhaps their efficiency may offer a solution to your present and post-war production problems. *Investigate today — write* GREENLEE BROS. & CO., 1840 Mason Avenue, Rockford, Illinois.

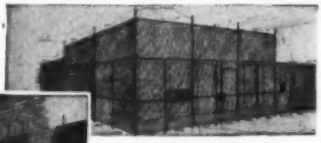


A Second Star Was Added To Greenlee "E" Flag March 11, 1944.

GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Acme WIRE MESH PARTITIONS FOR TOOL CRIBS AND STORAGE ROOMS





Window Guards

Stop sabotage—protect your factory and war production with Acme Wire Mesh Barriers. That's the most effective way of safeguarding tools, parts and critical materials, preventing loss, theft and malicious tampering. Acme Barriers provide

- Minimum interference with ventilation.
- Protection with minimum obstruction.
- Creates no fire hazard.
- Maximum economy in use of critical materials.
- Facility of rearrangement to meet changing conditions.

SEND FOR CATALOG

Acme WIRE & IRON WORKS
CANFIELD & MORAN STS., DETROIT 7, MICH.
THIS IS OUR FORTY-FIFTH YEAR



Hall collet chucks

All grip—no slip . . no bearings, friction, heat or lost power . . push out type . . full spindle capacity or over . . automatic adjustment . . work re-set without stopping lathe . . 2 sizes, 1" and 2" capacities . . order now with proper priorities.

Immediate deliveries.

HALL MANUFACTURING COMPANY
622 Tularosa Dr. ★ Ph. NO 9679 ★ Los Angeles 26, Cal.

since the rapid heat input to the parts to be brazed decreases the possibility of oxidation. Modern high-efficiency torches should be used and where possible, multi-tip torches. The flame should be neutral to slightly reducing.

The parts should be heated uniformly and as quickly as possible, with the heavier section or the one of higher conductivity being favored during the heating cycle, so that the parts to be brazed reach a brazing temperature simultaneously. The flame should be directed on the under side of the joint away from the brazing alloy and the joint heated until the alloy flows into the joint.

Torch brazing is suited for repair shop work, for one or two piece items, and for large and intricate shaped parts.

Dip Brazing

Dip brazing is adaptable to small parts and has limited application. In **metallic dip** brazing, the part to be brazed is dipped into a molten bath of brazing alloy while in the **chemical dip** process, the parts are carefully jigged, the brazing alloy pre-placed and the assembly submerged into a hot salt bath. The volume of the molten bath should be sufficient to prevent a marked lowering in temperature when the parts are immersed. It may be heated electrically or with gaseous fuels.

Resistance Brazing

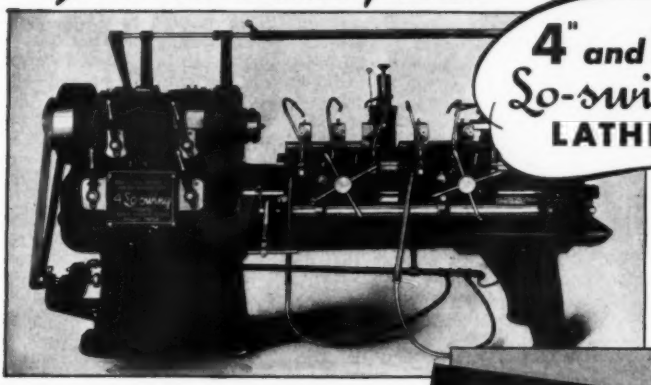
Resistance brazing is widely used in the electrical industry for brazing copper connections, bus bars and small parts. It is divided into two classes—one in which heat is generated in the electrode and transferred to the part to be brazed by conduction (incandescent carbon brazing) and the other in which the heat is generated by the resistance of the joint being brazed.

The incandescent method is widely used for joining bus bars. Equipment may be stationary or portable. The brazing material is usually pre-placed using a thin strip between the parts, yet equally good joints may be made by hand-feeding the alloy.

In straight resistance brazing, standard spot welding machines may be used. The electrodes should be of high resistance material. Pre-placing the alloy is essential since the brazing time is too short for hand feeding.

A PROVEN SHAFT TURNING MACHINE

For the small plant

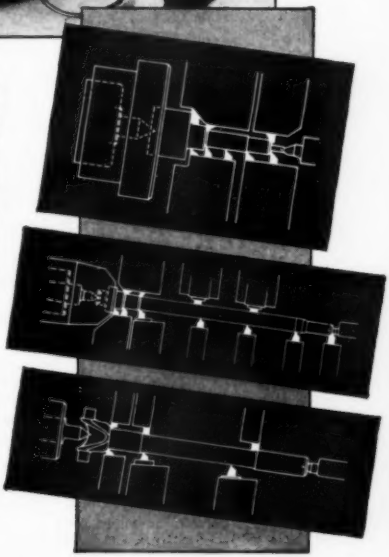


4" and 8" Lo-swing LATHES

● If you have shaft or similar work to turn, in small lots, this proven multiple-tool lathe will help solve your problems. It has an enviable record for accurate, low-cost production.

4" & 8" Lo-swing Lathes, in standard lengths, are particularly suited for the rapid turning of shafts up to 8-inch diameter by 132-inch length. Routine operations include turning several diameters, both straight and taper, squaring shoulders, necking for grinding and making form cuts. Power operated tools on a rear carriage are provided when necessary.

Adequate equipment for all ordinary work is available in standard accessories. For large lot production special tooling can be furnished to further increase production economies. Regardless of how complicated the tooling, the Lo-swing is quickly set up for different jobs. 4" & 8" Lo-swing Lathes are now available for quick delivery under Priority Regulation No. 24.



SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

LATHE NEWS *from* SENECA FALLS

Furnace Brazing

Furnace brazing is an ideal way of heating a variety of parts in large quantities. The furnace may be of the batch or pusher type. It may be heated by gas, oil or electricity, and it may use hydrogen cracked ammonia or other suitable non-oxidizing atmospheres. The brazing alloy must be pre-placed, the assembly placed in the furnace, heated quickly until the alloy flows, cooled and removed from the furnace. The parts must be clean—a flux is not always necessary but many times it aids the flow of the alloy.

Removal of Flux

After a joint has been brazed, the excess flux should be removed by washing in warm water. The discoloration adjacent to the joint may be removed by mechanical brushing or chemical dipping.

Conclusions

Brazing with low temperature alloys is a quick, efficient, and economical method of joining metals. It consists of:

1—Selecting the type of joint most suitable for the application with respect to strength, conductivity, and space limitations.

2—Selecting the brazing alloy best suited for the material being joined in regard to brazing temperature, strength of joint, and method of application.

3—Selecting the method of cleaning—mechanical or chemical.

4—Selecting the method of heating, determined by the geometry of the assembly, the size and the quantity to be brazed.

5—Fluxing the joints thoroly and uniformly.

6—Heat as quickly as possible in such a manner that the parts to be joined reach the brazing temperature simultaneously. Continue only until the brazing alloy flows freely thru the joint from the heat in the parts.

5 MINUTE JOB
IN 5 SECONDS



Jiffy GRINDING WHEEL DRESSER

"Just a twist of the wrist"



The JIFFY is a time saver for accurate dressing of grinding wheels. It is easily attached to any surface grinder . . . becomes a part of the machine. Dresses absolutely true with a "twist of the wrist", in 5 seconds, whether wheel is near chuck or way above it . . . and without disturbance to set-up. Well finished, hardened and ground (except bracket) . . . a money-saver in any plant. Write for Bulletin 602 W.

Manufactured by FLORIAN MFG. CO., Plantsville, Conn.

Order Through . . .

AMERICAN STANDARD CO. Southington, Conn.

Only 30 of these Slightly Used



SAV-WAY HAND INTERNAL GRINDERS

CEILING PRICE $4,970.00

NET PRICE $3,995.00

WIRE COLLECT FOR ACTUAL PHOTOS AND SPECIFICATIONS

- ✱ **No Priority Needed**
- ✱ **Immediate Delivery**
- ✱ **New Machine Guarantee**
- ✱ **Equipped with Famous Gold Seal Spindle**
- ✱ **Neoprene Insulated against Vibration and Distortion**
- ✱ **Ideal Machine for Postwar and Tool Room Work**
- ✱ **Practical Service Engineer Will Demonstrate in Your Plant**

Sav-Way INDUSTRIES
Machine Tool Division
BOX 117, HARPER STATION, DETROIT 13, MICHIGAN

BUILDERS OF HAND AND HYDRAULIC INTERNAL GRINDERS • PRODUCERS OF GOLD SEAL SPINDLES • PLUG GAGES • MICROMETER CHECKERS PRECISION AIRCRAFT, AUTOMOTIVE, AND ORDNANCE PARTS

A "Must" in Every Shop



NUPLA PLASTIC HAMMERS

Strike powerful, effective blows, yet cannot mar, cut or damage delicate surfaces or parts.

NUPLA Plastic Hammers — made of "Flex-O-Cryst," a semi-soft plastic that will not chip, crack or deform — are the ideal tools for metal forming, assembly work of all kinds, tapping inserts into molds and other tool and machine shop operations.

They will not mar, batter or cut metal or other materials; prevent "pile up" of materials worked; do not sting, vibrate or rebound; are unaffected by oil, gasoline, etc.

2 HARDNESS GRADES— 3 SIZES AND 7 WEIGHTS

"A" for general machine shop use.

"B" Hardened "Flex-O-Cryst" for metal forming.

SPECIAL "NON-SPARK" PLASTIC HAMMERS

For oil tool, mining, pyrotechnic and explosive work.

PNEUMATIC HAMMER INSERTS

For 3/8 in., 7/16 in., and 1/2 in. pneumatic hammers.

Complete details and prices on request.

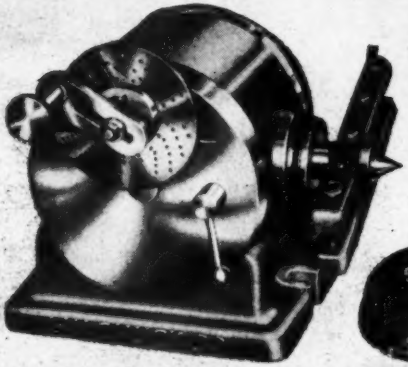
NEW PLASTIC CORPORATION

1017 N. Sycamore Ave., Hillside 8208, Los Angeles 38, Calif.

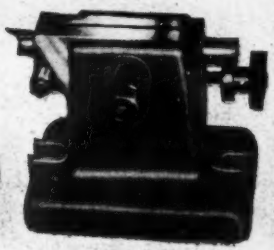
Manufacturers of NUPLA Products

L-W DIVIDING HEADS

Astonishingly low priced, but high in quality, these new L-W 11' Universal Dividing heads give the utmost in accuracy at a cos lower than any similar piece of equipment on the market. Ruggedly built, constructed with many new features which increase thei accuracy and their use for practical, profitable shop operation



Model BP



HEADSTOCK—New, ruggedly designed for maximum rigidity. Can be swiveled to an angle.

TAILSTOCK—New design, heavier and stronger.

HEADSTOCK SPINDLE—Tapered bearings, bored for No. 10 B. & S. taper. Increased diameter and length. Threaded nose 2¼" diameter 10 thread USS.

WORM—Made from special alloy steel, accurately finished, end thrust taken by ball bearings. Means are provided to make adjustment of worm wheel easily and accurately.

WORM WHEEL—Large diameter, 40:1 ratio, accurately generated, securely mounted on spindle.

EQUIPMENT—⅝" table slot tongues, three index plates are furnished, dividing all numbers to 50 and even numbers to 100, with the exeption of 96.T. The Index chart furnished gives all divisions obtainable to 380.

MODEL BP FOR PLAIN MILLING MACHINE

$128.55

MODEL AU—FULL UNIVERSAL FOR COMPLETE INDEXING AND SPIRAL CUTTING

$194.65

L-W CHUCK CO.

1-7 N. ST. CLAIR ST., TOLEDO, OHIO

BONDED

with Chicago

the Pedigreed Bond

It's the new bond that gives the ultra smooth finishes you get with Chicago Grinding Wheels — Precision finishes undreamed of before — Finishes so accurate that you can measure them in micro inches with a Surface Analyzer.

●

Write for Catalog listing all Chicago products and showing comparative photographs of finishes with different kinds of Wheels.



CHICAGO WHEEL & MFG. CO.

Headquarters for Mounted Wheels and Small Grinding Wheels

1101 W. Monroe St., Dept. HB, Chicago 7, Ill.

**Half a Century of Specialization has established our Reputation as the Small Wheel People of the Abrasive Industry.*

PERFECT FINISH INSURANCE



Whatever you have to finish — metals, alloys, plastics, wood, laminates or composition materials — you can do it better with Chicago Wheels.

Chicago Wheels have kept pace with the precision requirements of our war industries, and you can use them with confidence to finish civilian goods better in double quick time.

CHICAGO GRINDING WHEELS

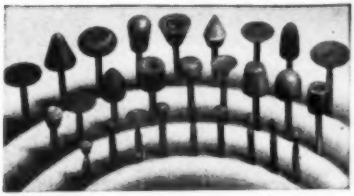
A wide range of grains and grades and — for the duration — sizes up to 3" in diameter.

CHICAGO MOUNTED WHEELS

The first made and the finest today. In a selection of bonds, abrasives and shapes to handle each job more efficiently.

TRY ONE FREE

We'll send without charge a Mounted Wheel or an FV Bond Grinding Wheel. Tell us size you'd like.



Send Catalog. Interested in HB-10

☐ Mounted Wheels. ☐ Grinding Wheels.

☐ Send Test Wheel. Size.....

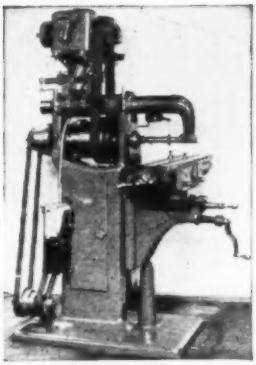
Name .....

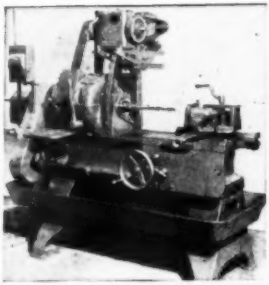
Address .....

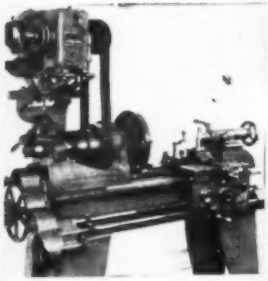
DRIVE-ALL INDUSTRIAL TRANSMISSIONS

A MODEL FOR EVERY MACHINE

★







SIMPLE ADJUSTABLE MOUNTING BRACKETS



DRIVE-ALL

Provides

Economy • Safety • Convenience •

Easy to install.

★

Safe and dependable to operate.

★

Positive power and speed control.

Rugged heat treated gears and shafts.

★

Right and left hand output in each transmission.

Ball bearing mountings throughout.

★

A modern method of machine driving.

★

An established leader in war production.

SEND FOR FREE CATALOG

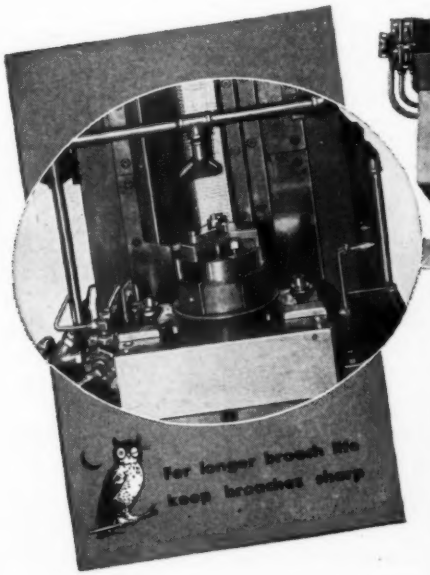
American's Complete Broaching Service

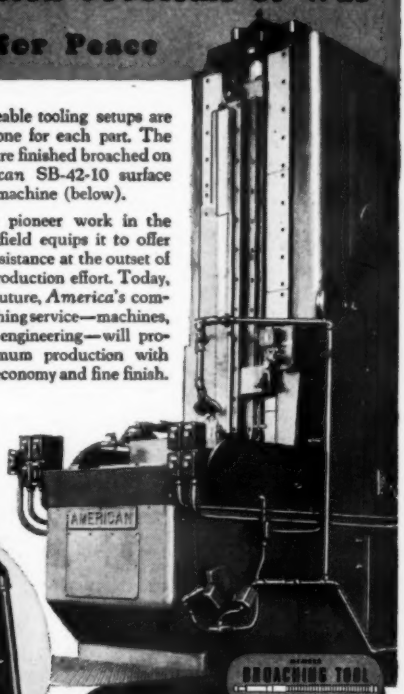
Solving Production Problems of War . . . Ready to Plan for Peace

The advantages of broaching by *American* are well known to the Nation's leading manufacturers. Almost every war industry has made use of broaching, the *American* way, to secure fast, accurate, economical output.

For example, in the production of a new aircraft part, one operation entails the finishing of a two-part stop sleeve. An *American* SB-66-15 surface broaching machine (right) rough broaches radii between the lugs, sides of the lugs, and flat across the index of the lugs. Two interchangeable tooling setups are provided, one for each part. The parts then are finished broached on an *American* SB-42-10 surface broaching machine (below).

America's pioneer work in the broaching field equips it to offer valuable assistance at the outset of any new production effort. Today, and in the future, *America's* complete broaching service—machines, tools, and engineering—will provide maximum production with maximum economy and fine finish.





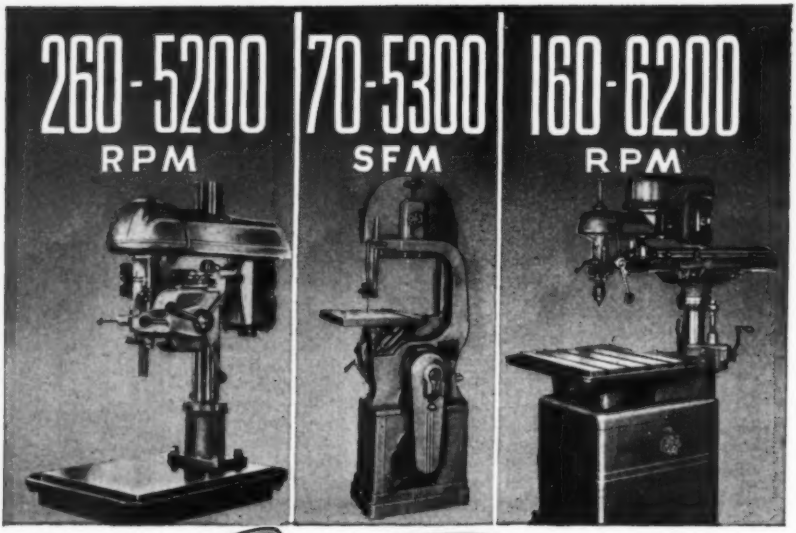
BROACHING TOOL

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

BROACHING MACHINES
PRESSES
BROACHING TOOLS

DIVISION S



GET THE *Correct* CUTTING SPEED WITH WALKER-TURNER MACHINE TOOLS!



Every material — every operation — has its proper speed . . . the speed at which machining is done most accurately, most economically, most efficiently.

Walker-Turner Machine Tools — because of their exceptionally wide ranges of cutting speeds — enable production men to hit the correct speed "on the button"! This gives Walker-Turner Machine Tools versatility for handling all materials in all types of operations . . . from every-day production to complicated, special tooling set-ups. These qualities may prove the answer to your own problems. Write for our catalog today!

WALKER-TURNER CO., Inc., Plainfield, N. J.

Walker-Turner
Machine Tools Offer These Advantages:

- Versatility
- Rugged construction
- Safe, simplified operation
- Low power consumption
- Low capital investment
- Low operating and maintenance cost

RADIAL DRILL — Drills to center of 62" circle. Head tilts 45° right or left. Maximum distance nose of chuck to table, 13½". Spindle traverse, 3¾". Chuck capacity, ½".

METAL-CUTTING BAND SAW — 14" and 16" models. Geared speed reducer. Table tilts to 45° and has mitre gauge groove. Blade tensioning device has spring cushions to absorb shocks.

20-INCH DRILL PRESS — Hand or power feed. Bench or floor, single or multi-spindle models. Drills to center of 20" circle. Feed 6". Capacity 1" in cast iron, ¾" in steel.

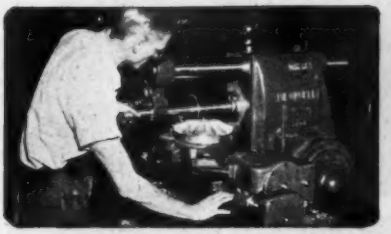
walker-turner COMPANY, Inc. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Fundamentals in Milling Practice

By Dr. H. A. Frommelt



There are three fundamental principles of good machine tool practice, viz., good work piece setups, proper choice and assembly of cutters and correct operation of the machines. Milling machine setups should be considered in terms of these fundamental principles. Consideration of the typical jobs described will help in handling similar operations. "The Editor"

Finish Mill Side of Spindle Gear Box

A 12" diameter tungsten carbide-tipped face mill cutter, revolving at 89 rpm is used to finish mill the side of a spindle gear box in this operation. The machine used is a Simplex bed type. The workpiece is being fed into the cutter at the rate of 5½" per minute.

The 12" tungsten carbide-tipped face mill cutter used for this job, so rotates that the cutting forces are directed downward against the table of the bed type machine. Plain surfaces such as these are economically milled in this manner. This gear box is difficult to hold, but the operator took advantage of the cast hole thru the front face to insert a T-bolt for clamping the workpiece rigidly to the table. The finished front face is used to locate the gear box accurately on the table. (See Fig. 99).

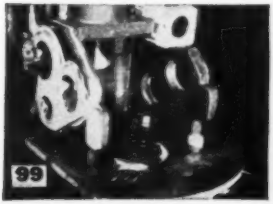
Form Mill Directional Lever

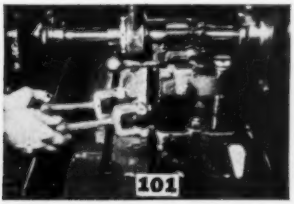
In order to form mill the directional lever as called for in this operation, a Simplex bed type machine was chosen. The workpiece, an SAE 1045 steel forging, is held in a two-station fixture. The spindle carrying the form cutter revolves 58 rpm while the table carries the workpiece into this cutter at the rate of 3½" per minute. The production rate of 100 pieces every six hours is maintained under these conditions. (Example 100).

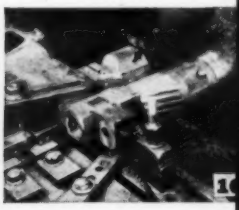
EXAMPLE NO. 100

Job Description—	Form mill directional lever.
Material—	SAE 1045 forging
Machine—	Simplex Bed Type
Speed—	58 rpm.
Feed—	3½ ipm.
Production rate—	6 hours/100 pieces
Fixture—	Two station.
Cutters—	4" hs form.

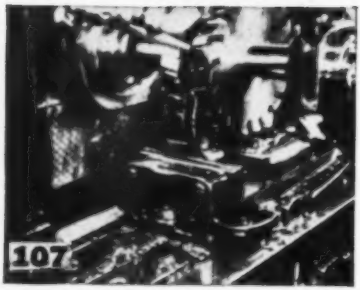
This operation illustrates the use of a form cutter to mill the side edges of

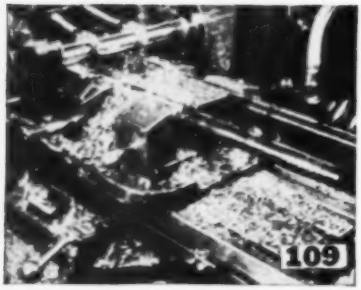

99

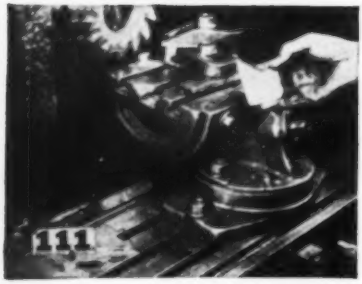

101


1









directional control levers. The cutter set-up is commendable. Note how the cutting forces are controlled by the rigid assembly of the arbor supports and cutters close to the spindle block. An overarm brace assists in counteracting the relatively large forces acting on the form cutter. (Fig. 101).

Mill Top Step on Cap

Milling the top step on a bracket with cap assembled, is accomplished by mounting an adapter plate on a milling machine table and bolting the assembled bracket to it. A No. 4 Plain Horizontal Machine with a 4½" by 6" face slab mill cutter is used for this operation. The cutters revolve at the rate of 75 rpm, while the table feeds the work into the cutters at the rate of 10" per minute. (Example 102).

EXAMPLE NO. 102

Job Description—	Mill top step on bracket with cap assembled.
Material—	Cast iron
Machine—	No. 4 Plain
Speed—	76 rpm.
Feed—	10 ipm.
Production rate—	10 hours/100 pieces.
Fixture—	Adapter plate.
Cutters—	4½"x6" special slab mill.

The 6" cutter with teeth on both end and periphery, mills a square corner into this bracket. The cutter is mounted in a special adapter without which it would have been impossible to reach the workpiece.

The cutter is rotating with the tip teeth turning away from the observer, while the workpiece is fed vertically. The forces are directed down, and therefore, against the table. (Fig. 103).

Face Mill Knee Gib Support

In order to face mill a cast iron knee gib support, a 4" tungsten carbide-tipped face mill is mounted in the spindle of the No. 4 Plain Horizontal Milling Machine. This cutter revolves at a rate of 355 rpm and the work is being fed into the cutter at a rate of 23" per minute. (Example 104).

EXAMPLE NO. 104

Job Description—	Face mill knee jib support
Material—	Cast iron
Machine—	No. 4 Plain
Speed—	355 rpm.
Feed—	23 ipm.
Production rate—	10 hours/100 pieces.
Fixture—	Special.
Cutters—	4" T.C. face mill.



With Rotary Files, the world's foremost file manufacturer now extends still further the scope of the well-known Nicholson slogan, *"A file for every purpose."*

After thorough study of the fast-growing uses of Rotary Files, Nicholson is prepared to provide both *Hand Cut* and *Ground-from-solid* types.

Each type is available in 16 standard styles or shapes; 3 cuts (Coarse, Medium and Fine); 64 sizes and in diameters ⅛" to 2".

For easy identification, each file shank is code-stamped to conform with Catalog and Price Sheet listings.*

Nicholson Rotary Files are manufactured from high-speed steel. Carefully shaped and true centered. Accurately cut or ground. Expertly hardened. . . . In every respect, upholding the Nicholson tradition for *The right file for the job* in the highest quality obtainable.

***SEND FOR CATALOG AND PRICE LIST.** Write us for any special information. For *deliveries, consult your mill-supply house.*

Nicholson File Co., 16 Acorn St., Providence 1, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES
FOR EVERY PURPOSE

NICHOLSON U.S.A.
MADE IN U. S. A.

For Precision Boring— Universal MIKRO-LOK Boring Bars



You can Depend on Micrometer Graduations for Controlling Hole Size

For finishing cuts with extreme accuracy. Extremely rigid. Easily and quickly adjusted like a micrometer to within .0005. All standard type shanks available. Singly or in sets. Write for catalog.



Army Navy "E" Flag Two Stars



Fighter Plane Given by employees

20%

20% Employees Bond deduction

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

This large piece is located in a fixture noteworthy for its simplicity and rigidity. It is so designed that the workpiece is fed to the cutter to permit milling the face at both an angle and a taper. Moreover, the 4" tungsten carbide-tipped face mill revolves counter clockwise so that the cutting pressures are directed downward thru the solid part of the fixture to the milling machine table, which has been brought close to the column face. Thus, good milling practice is represented in this operation. (Fig. 105).

Straddle Mill Elevating Arm

In this job, the straddle milling of a cast steel elevating arm is performed with two 10" diameter inserted tooth side cutters. The operation is done on a Simplex Bed Type Machine with the aid of a vise equipped with a special jaw. The spindle speed is 38 rpm and the table feed 3" per minute. (Example 106).

EXAMPLE NO. 106

Job Description—	Straddle mill elevating arm
Material—	Steel casting
Machine—	Simplex Bed Type
Speed—	38 rpm.
Feed—	3 ipm.
Production rate—	12 hours/100 pieces.
Fixture—	Vise and pin in one jaw.
Cutters—	2-10" inserted tooth side.

Study this excellent cutter setup. First of all, the arbor is rigidly supported and secondly, the workpiece has been centered in the vise jaws for equal holding pressures. Observe also, the choice of cutters. These may seem unusually large, but were necessary in order to mill the full length of the arm and allow clearance for the workpiece under the arbor after it has passed thru the cut. (Fig. 107).

Mill Keyway In Drive Shaft

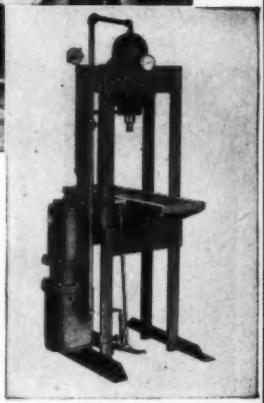
Two 3" staggered tooth cutters are employed to mill the keyways in a drive shaft in this operation of a No. 2 Plain Horizontal Machine. The cutters revolve at 93 rpm while the shaft is fed into the cutters at a rate of 7½" per minute. A special vise with two V-jaws is utilized to hold the shafts in position. (Example 108).

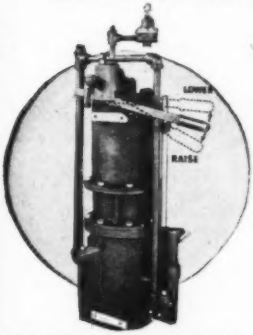
The V-jaws of this vise are clamped tightly about the round workpiece where the keyway is milled. Since the overhanging part of the shaft is not cut, it does not require support in this case. The two 3" diameter staggered tooth cutters

Versatile KRW PRESSES speed shell production



KRW Presses speed shell loading in one of the nation's largest arsenals.





THE KRW SPEEDI-BOOSTER

THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE. The KRW Speedi-Booster eliminates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.

Equipped with KRW Speedi-Booster, they have helped our Armed Forces get Enough and On Time

● When the history of America's Victory in this war is written, one of the most important chapter headings will read—MACHINES. One versatile machine, which was quickly adapted to war production, was the KRW Hydraulic Arbor Press. In many an arsenal, it has put the "fight" or powder in untold millions of shells of many types and calibers.

In literally hundreds of other widely varied manufacturing operations, basically similar KRW Presses have reduced costs. Using air pressure varying from 100 to 225 lbs., the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke — important on many operations.

KRW Hydraulic Presses are available in either standard form or specially built to handle a particular operation, for both vertical and horizontal action. We also manufacture suitable air compressors. Write for our Hydraulic Arbor Press Bulletin.

KRW

K. R. WILSON

10 LOCK ST., BUFFALO 2, N. Y.

Micro Supreme
LAY-OUT AND IDENTIFICATION DYE
IN 12 COLORS
Red
Blue
Green
Brown
Black
Purple
Cerise
Yellow
Violet
Tangerine
Chartreuse
Aquamarine

Used for Both
★TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL.
★QUICK IDENTIFICATION OF BAR STOCK, SHEET OR STRIPS, TOOLS, DIES OR PARTS.
DRIES INSTANTLY
QUICKLY, EASILY REMOVED
Circular giving full information and prices sent upon request.
MICHIGAN CHROME & CHEMICAL COMPANY
6346 E. Jefferson Ave. • Detroit 7, Mich.

EXAMPLE NO. 108

Job Description—	Mill keyway in drive shaft.
Material—	SAE-1020
Machine—	No. 2 Plain
Speed—	93 rpm.
Feed—	7½ ipm.
Production rate—	15 hours/100 pieces.
Fixture—	Special vise with V-jaws.
Cutters—	Two-3" staggered tooth.

used to mill the keyways are well chosen. First, because the teeth are balanced, and second, because by breaking up the chips they assist in preventing chip pressure from being built up between the cutter and the workpiece. (Fig. 109).

Mill Dovetail Wiper

A dovetail wiper made of Tobin Bronze is milled in this operation with a 6" diameter tungsten carbide-tipped face mill cutter. The spindle speed is 412 rpm and the work is being fed at a rate of 9¾" per minute. A tilting table is used as a fixture to hold these small pieces. (Example 110).

EXAMPLE NO. 110

Job Description—	Mill dovetail wiper.
Material—	Tobin bronze.
Machine—	No. 2 Plain.
Speed—	412 rpm.
Feed—	9¾ ipm.
Production rate—	2 hours/100 pieces.
Fixture—	Tilting table.
Cutters—	6" TC face mill.

By using this tilting table, the operator was able to adjust his setup quickly to obtain the 5° angle at which these dovetail wipers had to be milled. Tobin Bronze being easily machined, permitted a high chip load in this cut where a 6" diameter cutter with 16 teeth revolves at 412 rpm with a feed rate of 9¾" per minute. (Fig. 111).

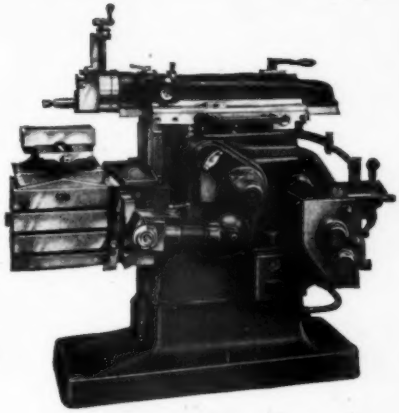
Milling Slots

Milling the slots on a chamfered end of a bearing spacer is accomplished in this operation by using a 3" high speed side cutter. This cutter is revolving at 100 rpm and the work is being fed into it at a rate of 10" per minute. The workpieces are chucked in a Plain Dividing Head and are supported by a jack. (Example 112).

Once more in this job we see the application of a chuck for holding work accurately. The jack that supports the bearing spacer absorbs the downward cutting pressure as the workpiece is fed vertically into the cutter. The Plain In-

HENDEY

12-INCH MOTOR DRIVEN CRANK SHAPER



CONSTRUCTION DETAILS

Start and Stop Levers placed for ram control either side of column.

Crank Gear runs in Massive Timken Bearings under pre-load.

Crank Pin and Block designed for maximum life with minimum wear.

Double Walled Cross Rail.

Three Bearing Saddle.

Universal Table with Tilting Top.

Tilting Top moves 15 degrees either side of center.

Positive stops for both horizontal positions of table.

Power Downfeed.

Wide range of cross feeds.

Mechanical lubrication.

This small Hendey Shaper is precision built, and is unapproached in freedom of operation.

Cutting speeds range from 182 ft. per minute on 6″ stroke maximum, to a minimum of 23 ft. per minute on 12″ stroke.

1874 — 70 years in the field of Machine Tools — 1944

THE HENDEY MACHINE CO.

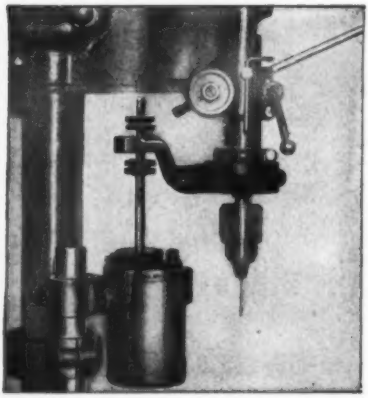
TORRINGTON, CONN.

BOSTON NEW YORK ROCHESTER DETROIT CHICAGO

"Have Not Lost a Drill in 3 weeks"

Reports one large New Britain user

COPILOT DRILL PRESS FEED REGULATOR



Enables totally inexperienced and unskilled operators to produce good work from the start . . .

Prevents violent contact of drill with work at start of operation.

. . . permits maximum production . . . eliminates unnecessary drill breakage . . . controls break-through.

Find out for yourself the ACTUAL SAVINGS ON ONE OF YOUR OWN JOBS. Pick a troublesome drilling operation, install a Copilot, and see the actual results. Write us today.

Special Devices COMPANY

BERLIN, CONN.

dex head is used to space the slots accurately.

EXAMPLE NO. 112

Job Description—	Mill slots on chamfered end of bearing spacer
Material—	Extra strong wrought iron.
Machine—	No. 2 Plain
Speed—	100 rpm.
Feed—	10 ipm.
Production rate—	5.2 hours/100 pieces.
Fixture—	Dividing head chuck and jack.
Cutters—	3" HS side.

The opposed slots are milled in a single pass and a capable operator uses the rapid traverse while feeding from one cut to the other, thereby eliminating dead time between cuts. (Fig. 113).

Boring Reverse Yoke

The boring of a reverse yoke in a milling machine is accomplished by means of a fly cutter set in a special solid bar arbor. This single tooth cutter is revolving at 1,000 rpm while the work is being fed at the rate of 5⅞" per minute. A vise equipped with special jaws is required to hold the workpiece and 100 are bored in eight hours. (Example 114).

EXAMPLE NO. 114

Job Description—	Boring reverse yoke.
Material—	SAE-65 bronze.
Machine—	No. 3 Plain.
Speed—	1000 rpm.
Feed—	5¾ ipm.
Production rate—	8 hours/100 pieces.
Fixture—	Vise and special jaws.
Cutters—	Fly cutter in bar.

The support under the yoke in this operation emphasizes the necessity of counteracting the cutting forces and distortion, and possible turning of the workpieces. By using a tungsten carbide tipped fly cutter revolving at 1,000 rpm, the operator has been able to achieve both economy and good finish. The high speed at which the material is removed is evidenced by the color of the chips caused by the high temperatures generated. Since this material is of bronze and only a single tool is cutting, no coolant is used to reduce the temperature at point of the cutting tool. Tungsten carbide can be used at high temperatures owing to its unusual characteristics. (Fig. 115).

Mill Radius Slot

This operation calls for milling of the straight portion of a 2" radius slot in cast iron on a sliding head Vertical Milling

The WYCO Line

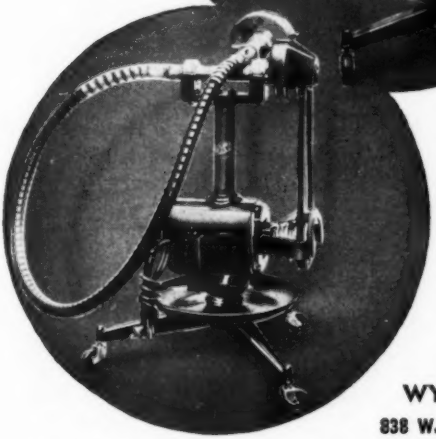
The WYCO Line of Flexible Shaft Machines and WYCO Tools are on the alert in aircraft and armament plants for Victory NOW! They're doing their share in maintaining civilian production everywhere, too. And for the Post War era—for the heavy needs of Post War production—they'll be on hand for even greater demands.

Every WYCO Flexible Shaft has the WYCO Patented Non - Metallic Innerliner.

Makes the Core last longer—Run smoother—Transmit more power.







Series 2A, 3A and 4A, ½ HP, ¾ HP, and 1 HP, Single Speed, General Purpose Machines. Floor, Bench, Suspension and Truck mountings.

Series 20 Tool Room Grinder, 1/3 HP and ½ HP 3-Speed Machines with Floor and Bench mountings.

Series 33-43-53, ¾, 1 and 1½ HP "HY-speed" Grinders with 3-Step Pulleys for 1800, 3600, 6000 R.P.M.

There are WYCO Flexible Shaft Units for every requirement, for every plant situation — from single and multiple speed Floor, Bench and Suspension models to multiple speed Jack Shaft and Radial Type machines—for heavy, medium or light duty.

All WYCO machines are backed by the same guarantee that has characterized the WYCO Line since 1929.

Send for our New Catalog.

WYZENBEEK & STAFF, INC.

838 W. Hubbard St. Chicago 22, Ill.

THREAD-ALL Tapper



Easily installed by average mechanic — converts any drill press into a precision tapping machine.

Check these advantages:

Handles small taps without fear of breakage. Takes sizes up to 1½" with ease.

Gives precision tapping without need of lead screws.

Electro-magnetically controlled positive depth setting.

No adjustments required for tap sizes.

Silent forward and automatic high speed reverse action.

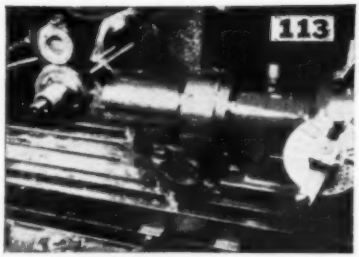
Taps right or left hand without adjustment.

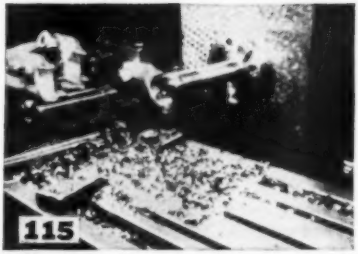
Machine may be used for drilling, reaming, counterboring, etc. without adjustment.

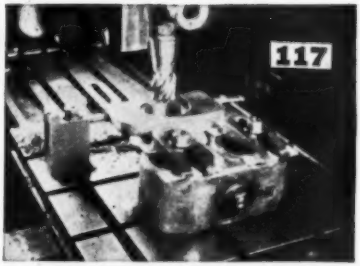
Write for full details.

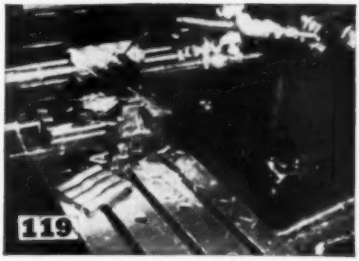
GRUEN GAUGE CO.

10039 Marcus Ave. Detroit, Mich.

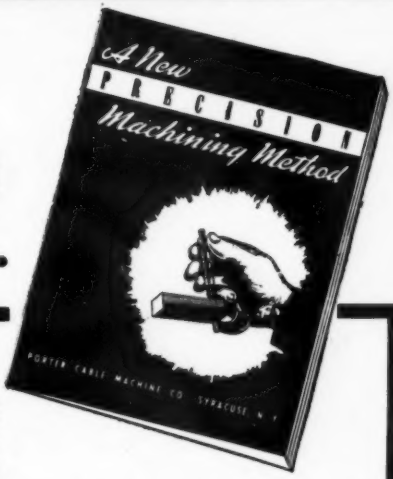








Learn What WET-BELT SURFACING Can Do for YOU . . .



★ More and more applications are being found every day for this advanced machining method that works an entire area at once, that produces final finish while taking the cut, that eliminates heat, dust, distortion, discoloring, fracturing. Wet-Belt surfacing is amazingly fast—5 to 25 times faster than previous methods. It is simpler — often eliminates need for jigs, as well as set-up and lock-up time. It is so accurate that tolerances of .0005" can be held when desired. It enables inexperienced workers to get increased production and superior finish. It can handle many operations now performed on grinders, millers, shapers, planers. It supplements other machines to step up production, reduce costs, and improve results.

The Porter-Cable Wet-Belt Surfacer has been a revelation in many shops. Learn more about it. Send for our new booklet, which is virtually a text-book on the subject. Fill in and mail the coupon right away.

PORTER-CABLE



Porter-Cable Machine Co.
300-10 Exchange Street
Syracuse, New York

Mail me free booklet, "A New Precision Machining Method."

Name .....

Company ..... Position.....

Address .....



for MOUNTING YOUR VISE, FIXTURE or used as ANGLE PLATE

Holds or mounts work rigidly, for checking, milling, drilling, shaping, grinding, boring, welding and pattern making.

Quick, accurate adjustment to any desired angle, set with protractor. Easy to use. Three standard sizes. Send for literature and prices.

METRO-VISE CO.
235 STEPHENSON BLDG.
DETROIT 2, MICHIGAN

Machine. A 2" end mill is used at a speed rate of 144 rpm with the workpiece fed at 3½" per minute and 100 pieces are finished in nine hours. (Example 116).

EXAMPLE NO. 116

Job Description—	Mill straight part of 2" radius slot.
Material—	Cast iron.
Machine—	No. 4 Sliding Head Vertical.
Speed—	144 rpm.
Feed—	3½ ipm.
Production rate—	9 hours/100 pieces.
Fixture—	Special fixture clamp.
Cutters—	2" end mill.

The use of a sliding head vertical milling machine for this operation permits more rapid adjustment of cutter to the workpiece. The job is mounted securely on an adapter plate which offers greater flexibility in making setups. The rigid holding of this workpiece represents good milling practice.

In regard to the cutter setup, the end mill for this operation is revolving clockwise and, hence, the pressures on its right hand flutes tend to force the cutter into the spindle. This is sound milling practice. End mills must be properly selected and revolved to avoid the tendency of turning out of the spindle. (Fig. 117).

Milling Flat on Reverse Link

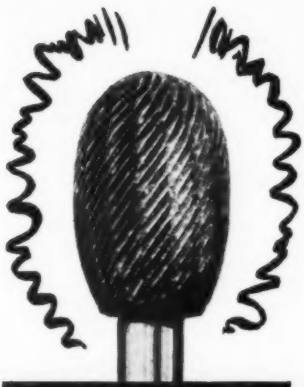
The specifications of this job call for milling of a "flat" on a reverse link of cold rolled steel. The workpiece is mounted in a vise clamped to the table of a Simplex Bed Type Milling Machine. The spindle rpm is 112 and the table feed is 5" per minute. 100 pieces are completed every four hours. (Example 118).

EXAMPLE NO. 118

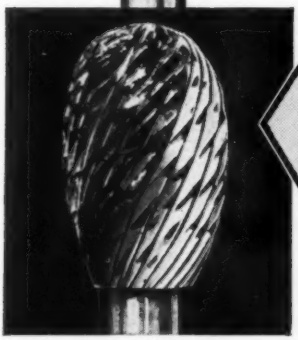
Job Description—	Mill flat on reverse link
Material—	Cold roll steel
Machine—	Simplex Bed Type
Speed—	112 rpm.
Feed—	5 ipm.
Production rate—	4 hours/100 pieces.
Fixture—	Vise.
Cutters—	4" plain helical.

This operation is performed with a single helical angle slab mill. Note that the bottom teeth of the cutter are coming towards the observer and the workpiece is being fed into the cutter, away from the observer. The pressures on the cutting edges of the single helical angle cutter are directed at right angles against those cutting edges. A little study shows that the horizontal pressure tends to pull the arbor assembly out of the spindle.

WORN OUT BUT STILL GOOD!



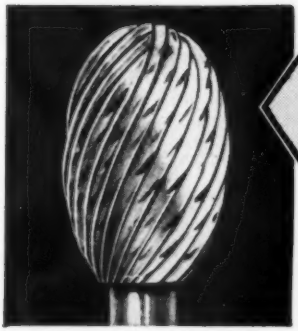
This file-cut bur is, for all practical purposes worn out—all done. But Pratt & Whitney can save it—can make it as good as new. Our accurate re-grinding process is saving thousands of burs every day . . . rejuvenating them . . . making them live and work many times their normal life span.



PARTIALLY RECUT

We are doing this job month in and month out for some of the largest bur users in the country. Here you see the worn-out bur halfway through our reconditioning process. The old bur file cuts are being replaced by razor sharp cutting edges at just the right rake, correct spacing and depth.

Send us your worn-out burs. Pratt & Whitney "know how" will make 'em sharp and accurate, ready for more hours of production. Many burs can be reground several times.



AS GOOD AS NEW!

Here the bur is completely reground, as good as new. It is subjected to the most rigid inspection for sharpness of cutting edges, rake, depth, flute spacing and concentricity. Not until it meets this "equivalent to new" inspection is it packed for shipment back to you.

PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DIVISION
WEST HARTFORD 1, CONN.

This is a definite violation of the second principle of good milling practice, namely, a correct setup. (Fig. 119).

Mill Slots in Spline Sleeve

A ½" two-lip end mill is used in this operation to mill the slots in a spline sleeve. The workpiece is SAE 4615 steel and the operation is performed on a No. 2 Sliding Head Vertical Milling Machine. The workpiece is mounted between a dividing head and tailstock and assembled on a mandrel. The spindle speed is 412 rpm, and the feed rate is 1¾" per minute. (Example 120).

EXAMPLE NO. 120

Job Description—	Mill slots in spline sleeve.
Material—	SAE-4615.
Machine—	No. 2 Sliding Head Vertical
Speed—	412 rpm.
Feed—	1¾ipm.
Production rate—	14 hours/100 pieces.
Fixture—	Dividing head, tail stock and special mandrel.
Cutters—	½" two-lip end mill.

The specifications call for slots to be milled into the spline sleeves as indicated by the operator. By mounting this workpiece on a mandrel and locating it between a dividing head and tailstock, it can be indexed to the various required positions easily and economically.

A ½" two-lip end mill is properly selected for this operation because its large clearance prevents clogging of chips and the building up of troublesome pressures. (Fig. 121).

Circular Mill Key and Pad Face on Lever

A 1¼" high speed steel end mill is used to circular mill a key and pad face on a forged steel lever. This operation is performed on a No. 3 Sliding Head Vertical Miling Machine with the spindle revolving at 214 rpm with the workpiece being fed into the cutter on a Rotary Table at a rate of 5⅞" per minute. The production is 35 hours per 100 pieces. (Example 122).

EXAMPLE NO. 122

Job Description—	Circular mill key and pad face on lever.
Material—	SAE-1020 Steel forging
Machine—	No. 3 Sliding Head Vertical
Speed—	214 rpm.
Feed—	5⅞ ipm.
Production rate—	35 hours/100 pieces.
Fixture—	Rotary table.
Cutters—	1¼" HS end mill.

NEED GOOLANT PUMPS?



BRADY-PENROD MODEL 7500
Centrifugal coolant pump and tank—a neat, compact unit highly suitable for use where abrasives are a factor.

Good pumps PAY. Buy the kind used as *standard equipment by many leading machine tool manufacturers*—BRADY-PENROD. Model 7500, shown above, is one of a complete line designed to meet every need. It handles all coolant liquids—kerosene, solubles, light and medium oils, etc., 4 to 100 g.p.m. Tank sizes, 6, 15, 30 gal. or larger, with as many hoses and nozzles as required. Discharge pipe is cast integral with pump and brought to outside of tank. The hinged cover allows cleaning without disconnecting return line.

All BRADY-PENROD pumps have heavy-duty, standard construction NEMA motors, ⅛ to 1 H.P., any current, phase, cycle.

Brady-Penrod
Incorporated
2500 S. Madison St., Muncie, Indiana, U. S. A.
1945 Santa Fe Ave., Los Angeles, Calif.

Check these Increases in Tool Life Obtained by

Cold Treating

in a Deepfreeze Industrial Chilling Machine



Operation	Tool	Tool Life Before Cold Treatment (Number of pieces machined per grind)	Tool Life After Deepfreeze Cold Treatment	Increase
Milling foot pads on chrome moly steel motor mound	4½" end mill	40	84	110%
Drilling 338 holes in aluminum airplane fin	No. 29 drill	112	280	150%
	No. 21 drill	54	108	100%
	⅛" drill	82	164	100%
	No. 41 drill	144	288	100%
Drilling 16 holes in chrome moly steel motor mound	No. 45 drill	8	50	525%
Drilling 12 holes in chrome moly steel side plates of motor mound	Combination 2⅝" drill and ⅜" reamer	60	140	133%
Drilling 2 stainless steel parts	F drill	200	300	50%
Drilling holes in buck board for gun turret	No. 30 drill	10	32	220%
Average Increase in Tool Life on 6 Typical Jobs in This Plant...				165%

Manufacturer Averages 165% Increase on Six Typical Jobs...

Sub-zero treatment in a Deepfreeze −120° F. Industrial Chilling Machine produced an average increase of 165% in the life of tools used on six typical jobs in one plant. Equal or longer life was obtained from subsequent grinding in most cases. The following procedure is used:

1—Heat part to approximately 300° F.

2—Allow to return to room temperature (approximately 100° F.)

3—Chill for 2 to 6 hours at minus 120° F. in Deepfreeze machine ⅔ full of methylene chloride convection fluid.

4—Allow to return to room temperature.

Repeat cycle six times.

Equally profitable results are possible in every factory, jobbing shop and heat treating plant. Deepfreeze industrial chilling units are also effective for shrink-fit assembly, stabilizing of gauge blocks and instrument testing.

Get FREE Additional Facts



Write for *"Cold Treating Practice"* — a 40-page illustrated booklet containing latest information on how and where to use sub-zero temperatures. Ask for Bulletin No. 1-4.

Only Motor Products can make a "Deepfreeze"

Deepfreeze

2319 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michigan

INDUSTRIAL DIAMOND TOOLS FOR EVERY USE



Our No. 703 — three layers of seven diamonds each. Multiplicity of cutting points: depending on diameter of wheel, four or more diamonds will always contact the wheel, giving finer dressing and precision finish. Recommended in all straight-faced dressing and truing on wide-faced, hard silicon carbide wheels. Used most effectively on Cincinnati Centerless, Norton Cylindrical, Landis Cylindrical, and Cincinnati Cylindrical Grinders.

Requires fewer passes across the wheel.

Generally used with fast dressing traverse.

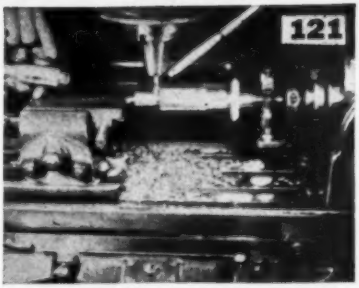
"Experts agree they are the best on the market."

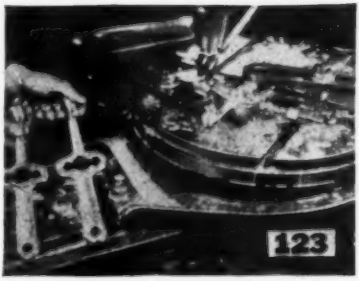
FOR BETTER DRESSING

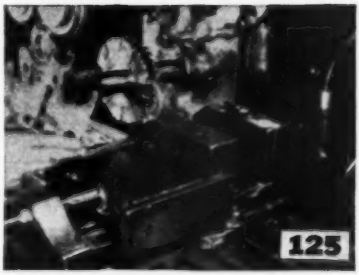
Molina

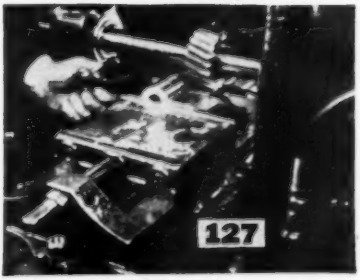
INDUSTRIAL DIAMOND CO. OF U.S.

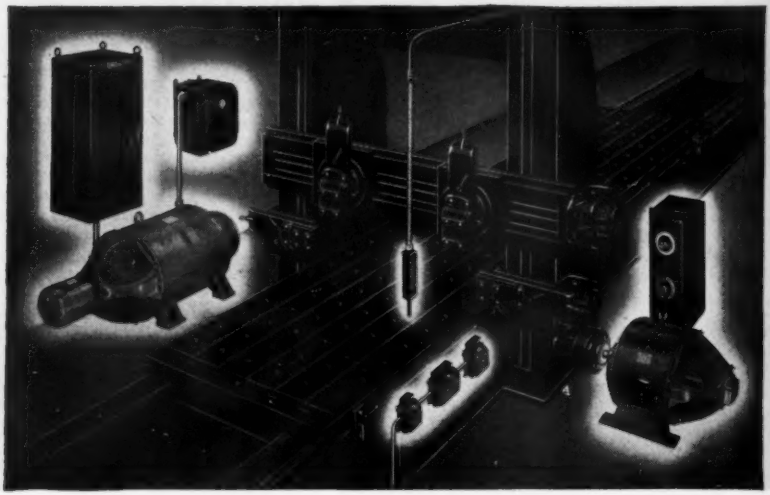
31 W. 47th St., New York 19, N.Y.
Branches: London; Bahia, Brazil











Planing the Humps OFF THE SPEED CURVE

To take lost-time humps out of the speed curve requires close, accurate control, a wide speed range and smooth, quick reversals.

Westinghouse direct-current variable voltage planer equipment does all this—giving more cutting strokes per minute. Standard equipment provides wide variation in speeds over a range of 30 to 1, and includes the patented Westinghouse Rototrol speed control.

Planing up to shoulders and in blind pockets is possible, because it reverses to a line. Sudden heavy loads won't change the speed or stall the machine.

This equipment forms a complete variable voltage drive system for planers, millers, slotters and other reciprocating-motion machines. For complete information, just call your nearest Westinghouse office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

J-21308A

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

THE MACHINE IN MACHINE TOOLS

ALMOND



TRIPLE JAW
DRILL CHUCK

SINCE 1872

ALMOND Three Jaw Drill Chucks are widely used for holding drills, taps, reamers and other tools, and are always used in connection with and by being mounted upon some form of machine tool such as drill press, lathe, or milling machine. Also used on portable tools, principally electric and pneumatic drills.

ALMOND Three Jaw Drill Chucks were the first to be placed on the market; they are the pioneers of the field. These years of research and top material going into their production have made them outstanding in the field.

WRITE FOR DETAILS

T. R. ALMOND CO.
ASHBURNHAM, MASS., U.S.A.

The method of making a correct dimension setup is important in this operation. The workpiece is mounted on a power driven rotary table and so located that as the table revolves, the cutter mills the projections at a specified radius from the center of the lever.

To do this, the center of the lever is located to coincide with the center of the rotary table. Thus, as the workpiece passes under the end mill, the key and the face of the pad on the lever will be milled at the proper radius. (Fig. 123).

Straddle Mill Sides of Yoke

Here the operator is called upon to straddle mill the sides of a yoke of SAE Bronze. Two 5" by ½" side cutters are mounted on the arbor of the No. 3 Plain Horizontal Milling Machine. These cutters are revolving at a speed of 57 rpm while the workpiece is fed into the cutters at a rate of 3⅜" per minute. A vise equipped with special jaws and a jack are used to hold the workpiece. (Example 124).

EXAMPLE NO. 124

Job Description—	Straddle mill sides of yoke.
Material—	SAE-65 bronze.
Machine—	No. 3 Plain.
Speed—	57 rpm.
Feed—	3¼ ipm.
Production rate—	7 hours/100 pieces.
Fixture—	Vise, special jaws and jack.
Cutters—	5"x½ side.

This operation is noteworthy for the manner of feeding the workpiece into the staggered tooth side cutters. The workpiece is so located that it is fed into the side mills for a full cut in one pass. This is good practice since the table is moved a shorter distance horizontally than if the workpiece were fed vertically. Economy in an operation frequently can be effected by choosing the proper method of feeding a workpiece into the cutters. (Fig. 125).

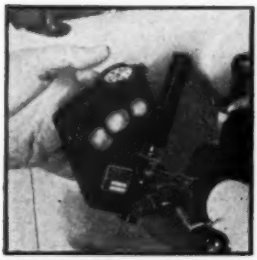
Mill Index Fingers

One 4"x2" spiral slab milling cutter is used in this job to mill index fingers for a dividing head. These fingers are SAE 1020 steel forging and are mounted in a vise equipped with special jaws. The spiral cutter is revolving at 58 rpm and the feed is 3½" per minute. (Example 126).

All 18 of these index fingers are milled in one pass, for economy in operation.

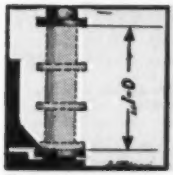
Why Not SEE Rather than feel



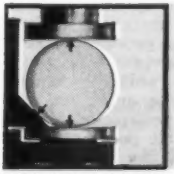


Weight of Gage and operator's hand rests upon the fixed contact. Gage is only ½" wide.

A *light* thumb pressure retracts the sensitive contact. Work surface is not marred. The contact movement is transferred direct to indicator.



The upper or reference contact is adjustable to any dimension within one inch.



Backstop locates work in center of contacts and is adjustable for size.

FEDERAL INDICATOR SNAP GAGE *with Retractable Anvil Adjustable for Size No Lost Motion*

This Model 1330 P-100 Visual Dial Indicator Snap Gage marks a decided step ahead in gaging practice. Conventional type, fixed or solid snap gages depend upon "feeling", and personal variations in the sense of touch influence the inspection accuracy. But, you **see** with this.

The Model 1330 P-100 has other advantages too — **The retractable anvil** makes it easier to apply, and it eliminates all excuses for marring the surface of highly finished workpieces. **It is easily adjusted** to any dimension within one inch and locked in place. **There is no lost motion.** The movement of the sensitive contact is transferred directly without error to the Dial Indicator. **The weight of the Gage and the inspector's hand rests upon the fixed or reference contact. It is thin:** only ⅝". It is small; not over 6" at the longest point. It is light; weighs only 15 ozs. It reads in tenths (.0001"). Contacts are hard wearing Norbide (Made by Norton Co.) For more details concerning this modern snap gage write

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET · PROVIDENCE 1, R. I.

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

GAGES



In 48 Hours

(in many sizes)

Plug Gages, Ring Gages, Snap Gages (adjustable and solid). Flush-Pin Gages, Built-up Gages.

OUR GOOD GAGES

Prevent Spoilage
Speed-Up Operations
Utilize Less Skilled Help
Reduce Costs

EASTERN PRECISION GAGE CO.

320 Bayway, ELIZABETH 2, N. J.

We operate day-and-night. Phone us at any hour, Elizabeth 2-9519

Send for illustrated folder B

EXAMPLE NO. 126

Job Description—Mill index finger.
Material— SAE-1020 steel forging
Machine— No. 2 Plain.
Speed— 58 rpm.
Feed— 3½ ipm.
Production rate—14 hours/100 pieces.
Fixture— Vise with special jaws.
Cutters— 4"x2" spiral.

The setup has good and bad points. It is good insofar as the workpieces are clamped in the center of the vise jaws, where the cutting forces can be counteracted easily. The cutter assembly, however, is bad, since the arbor support could have been located much closer to the cutter. This would have strengthened the assembly considerably and eliminated unnecessary vibration. (Fig. 127).

Mill Serrations

In order to mill serrations in a quill clamp shaft, a 2" diameter serration form cutter is mounted on the arbor of a No. 2 Plain Horizontal Milling Machine. This cutter revolves at the rate of 202 rpm and a feed rate of 21" is selected. These quill clamps are held between a dividing head and tailstock and 100 pieces are produced in nine hours. (Example 128).

EXAMPLE NO. 128

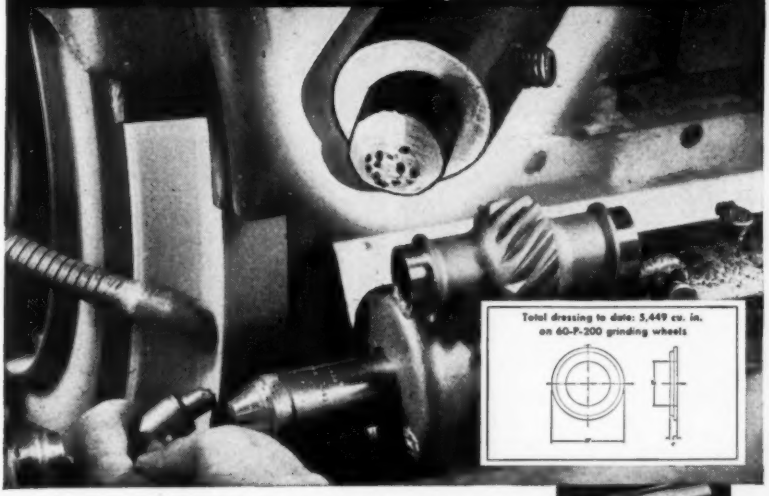
Job Description—Mill serrations in quill clamp shaft.
Material— No. 1 Stressproof steel
Machine— No. 2 Plain
Speed— 202 rpm.
Feed— 21 ipm.
Production rate—9 hours/100 pieces.
Fixture— Dividing head and tailstock.
Cutters— 2" serration form (cutting 8 serrations in 1 pass)

The form cutter used to mill the serrations has eight teeth on its circular face and thus mills eight serrations at one time. The dividing head permits indexing the workpiece to mill groups of serrations successively until the entire periphery has been serrated. Note again the use of a chuck to hold the workpieces securely and the commendable position of the arbor support close to the cutter. (Fig. 129).

Mill Large Spline

Large splines are milled on a speed change shaft on this job. This shaft is of SAE 4340 steel and is milled with a 2½" spline cutter. The spindle speed is 86 rpm while the work is being fed at a rate of 4½" per minute. The shafts are mounted

TAKING IT ON THE NOSE for 90 DAYS . . . and Still Going Strong!



In continuous use for 90 days in the plant of a well-known midwestern aircraft engine plant, dressing the face and recess in a 60-P-200 grinding wheel—that's the record of the No. 2-B diamond-impregnated Carboloy Dresser shown above. Taking it "on the nose" for 3 months and still going strong—still plenty of diamonds left for additional service, after dressing a total of 5,449 cu. in. of wheel stock.

Carboloy Diamond Dressers are especially designed for unusually long periods of service on a wide range of work—the "tough" jobs as well as the "easy" ones. Loaded from base to "peak" with high quality diamond particles permanently held in a Carboloy matrix, these dressers require no remountings and provide layer upon layer of diamond cutting surfaces. Just a quarter turn daily of dresser in holder—plus an occasional 2- to 5-minute reconditioning—and the Carboloy Dresser keeps working throughout an extremely long period of profitable life. Try it once and you'll never go back to "temperamental" costly single diamonds.



CARBOLOY COMPANY, Inc.

11139 EAST 8 MILE AVENUE • DETROIT 32, MICHIGAN

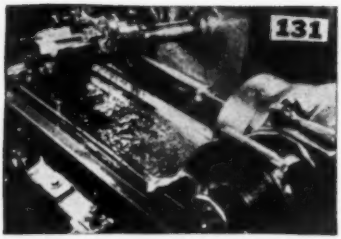
Birmingham • Chicago • Cleveland • Detroit • Los Angeles
Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston

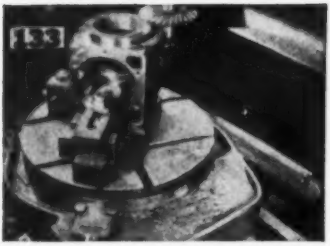
Another USE FOR CARBIDES

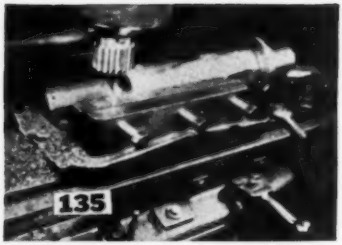
CARBOLOY CEMENTED CARBIDE DIAMOND DRESSERS IMPREGNATED

For GENERAL USE ON GRINDING WHEELS









THE *New*

DEARBORN MODEL "B" CHUCKING and INDEXING FIXTURE

FOR USE ON MILLING MACHINES

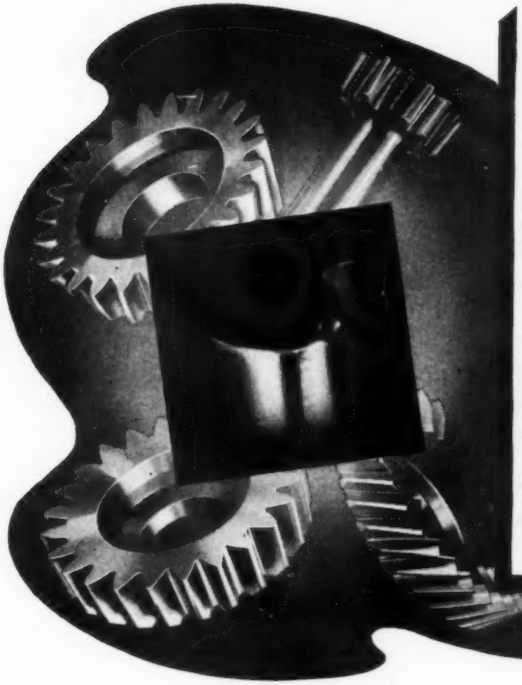


The Dearborn Fixture meets the demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the country.

Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces.

Write for Folder

J. W. DEARBORN ANSONIA, CONN., U. S. A.



HOW TO INCREASE SHAPER CUTTER LIFE 300% PER SHARPENING

One of the simplest methods of increasing the life of shaper cutters is to protect the cutter against nicks like the one above. Normal amount of stock removal to sharpen a Michigan shaper cutter is only around 0.007 inches on the average. A nick like this one may mean the necessity of removing .025 to .030 inches of metal to resharpen the tool. The potential output of the tool for three additional sharpenings has thus been wasted.

While nicks in gear cutting tools may be caused by a variety of reasons, the most prevalent one is carelessness in handling. The very hardness which gives Michigan gear cutting tools their outstanding performance means that such tools require careful handling to prevent chipping, nicking or breakage. Extensive field investigation has revealed that in 4 out of 5 cases of damaged tools, the damage is due to incorrect or careless tool handling to and from machines, in the store-room, in sharpening (sharpening heat-checks which later result in tool failure), etc.

Do you have a copy of "Shaping"? Ask for Bulletin GS-42.

ORIGINATORS of GEAR SHAVING

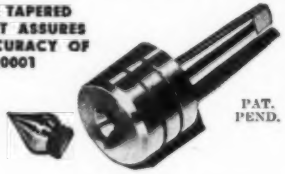
MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

Empire LIVE CENTER
WITH REPLACEABLE POINT
ACCURACY • HIGH SPEED • HEAVY DUTY

THE TAPERED SEAT ASSURES ACCURACY OF ± .0001



PAT. PEND.

Points for Various Operations



A. Very large, for pipe or tubing work
B. Extra long point used in facing operations
C. Extra wide point for large diameter work
D. Standard point
E. Blank made of soft tool steel for nests
F. Female for work not having centers

Send for Literature



TERRITORIES OPEN
Manufactured by
KING PRODUCTS
49 SPRING STREET • NEW YORK 12, N. Y.

between a dividing head and tailstock for accuracy in spacing the splines. (Example 130).

The setup in this operation is commendable for its relationship of table to column and of the arbor support to the

EXAMPLE NO. 130

Job Description—Mill large spline for grind on speed change shaft.
Material— SAE-4340
Machine— No. 3 Plain.
Speed— 86 rpm.
Feed— 4¼ ipm.
Production rate—44 hours/100 pieces.
Fixture— Dividing head and tailstock.
Cutters— 2½" spline.

cutter. Because the shaft being milled is quite large in diameter and not too long, the operator did not use a jack or similar support underneath the workpiece. This is a roughing cut and accuracy is not an important factor since the splines are finish ground later. The operator, however, did make his cutter support very rigid by locating the arbor support close to the cutter. By using a dividing head, the splines are spaced accurately without removing the shafts from the chuck until all the splines are milled. (Fig. 131).

Circular Milling

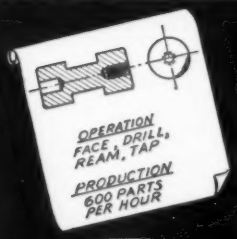
To circular mill the edge of a spindle block at 30° angle, a high speed form milling cutter is used. This spindle block is made of cast iron and the operation is performed on a No. 3 Sliding Head Vertical Milling Machine, with spindle revolving at 90 rpm. In this operation, the workpiece is fed by hand on a rotary table. (Example 132).

EXAMPLE NO. 132

Job Description—Circular mill edge of spindle block at 30°.
Material— Cast iron.
Machine— No. 3 Sliding Head Vertical.
Speed— 90 rpm.
Feed— Hand feed.
Production rate—13 hours/100 pieces.
Fixture— Rotary table.
Cutters— 30° angle hs form.

The workpiece is clamped on a rotary table in such a position that when the table revolves, it will describe the proper arc under the angular cutter. Thus, an angular face is milled into this workpiece. The rotary table is revolved by hand, leaving the feeding of the workpiece to the judgment of the operator. Noteworthy is the ingenuity of the setup and the use of an angle cutter to meet the specifications. (Fig. 133).

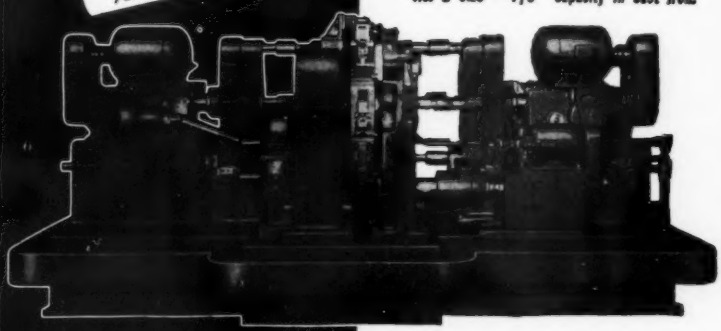
Avey Automatic METHOD No. 5



THE Avey CAM FEED UNIT

No. 1 Size—1/2" capacity in cast iron.

No. 2 Size—7/8" capacity in cast iron.

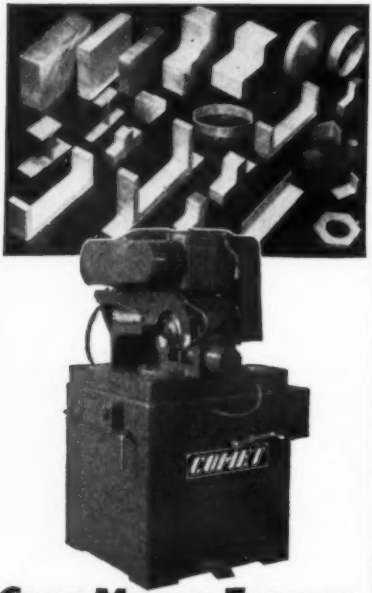


Accelerated production obtainable by free loading time and automatic ejection of work. Fatigue element lessened by automatic indexing.

METHOD No. 5 — lower cost per part, completed double end work at one clamping — (no relocation) — greater accuracy, enabling semi-skilled operators to deliver high quality production speedily, accurately, efficiently, with a minimum of supervision.

designed for multiple operations on individual parts—(double end at one clamping of work) — facing, drilling, reaming and tapping.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



CUTS METAL FASTER

More Accurately

If you require accurate, high-speed cutting of non-ferrous metals and other materials, here is your machine. Cuts by smooth, fast, milling action. Pneumatic hydraulic feed is coordinated with speed of cutting blade. Vise synchronized with action of ram. No vibration because of weight distribution. Has 4 speed transmission and variable feed mechanism. Built-in coolant system. Properly operated, blade breakage is eliminated. Write or wire for free literature.

CONSOLIDATED MACHINERY & SUPPLY CO., LTD.
2031 SANTA FE AVE., LOS ANGELES, 21, CALIF.

COMET
AUTOMATIC CUT-OFF MACHINE
MODEL MH

Mill Flat on Elevating Nut Extension

Milling the flat on a cast iron elevating nut extension is done with a 3½" shell end mill cutter. The workpiece is mounted in a V-jaw vise and a speed of 75 rpm and a feed of 7⅝" per minute are used. The 100 pieces require five hours for completion. (Example 134).

EXAMPLE NO. 134

Job Description—	Mill flat on elevating nut extension.
Material—	Cast iron.
Machine—	No. 3 Sliding Head Vertical.
Speed—	75 rpm.
Feed—	7⅝ ipm.
Production rate—	5 hours/100 pieces.
Fixture—	V-jaw rack vise.
Cutters—	3½" shell end mill.

For rigidly holding this round workpiece, the operator has selected a V-jaw rack vise. Work is fed to the cutter toward column face, the cutting forces being counteracted by the front jaw of the vise. The 3½" diameter shell end mill is not a good selection because width of the cut is only 2", which means that time was lost in waiting for this large cutter to engage as well as clear the workpiece. A 2½" cutter would have been large enough for the operation. (Fig. 135).

Straddle Mill Secondary Shifter Fork

To straddle mill a secondary shifter fork of SAE 65 Bronze, two 6" interlocking staggered cutters are mounted on the arbor of a No. 3 Plain Horizontal Machine. These cutters are revolving at a speed of 75 rpm and the work is fed at a rate of 5⅞" per minute. The forks are set in vises equipped with special jaws and stops. (Example 136).

EXAMPLE NO. 136

Job Description—	Straddle mill secondary shifter fork.
Material—	SAE-65 bronze.
Machine—	No. 3 Plain
Speed—	75 rpm.
Feed—	5⅞ ipm.
Production rate—	3-7/10 hours/100 pieces.
Fixture—	Vise, special jaws and special stop.
Cutters—	1"x6" interlocking.

The cutters are revolving counterclockwise, and hence, the forces tend to rotate the workpiece downward. This is counteracted properly by a stop clamped on top of the vise. This stop also acts as a location point in setup of the workpiece.

Interlocking staggered tooth cutters are

PEERLESS UTILITY FOR MISCELLANEOUS METAL SAWING!



LOW PRICED!

MOTOR OR BELT DRIVE!

WET OR DRY CUTTING!

THIS low-priced UTILITY Metal Cutting Saw sets new standards of value in power-driven metal sawing machines. It's made for wet or dry cutting —is motor or belt driven—has capacity of 4½" x 4½".

Cutting stops automatically at end of cut or at any gauge-set point. Sensitive spring and cam type feed mechanism compensates for varying hardness of materials. Feed pressures are adjusted by hand screw. Heavy one-piece base and frame insures straight cutting and long life with sustained accuracy. Why hack away by hand when you can save time, materials and manpower with the low-priced Peerless UTILITY?

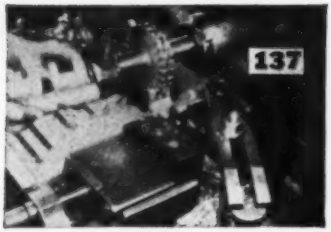
Mail the coupon for Bulletin D.C. 54. If you're doing tool and die work you'll also want Bulletin 53 on the famous Peerless Vertical Metal Sawing Machine.

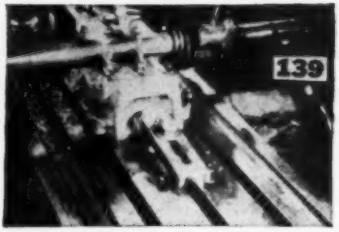
PEERLESS
MACHINE COMPANY
RACINE • WISCONSIN

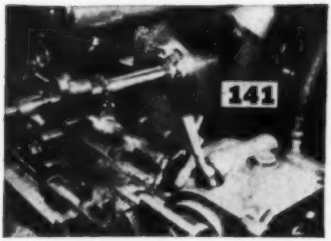
Dept. MT-1044:

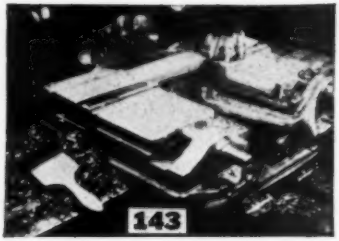
☐ Rush Bulletin D.C. 54 on Peerless UTILITY Metal Cutting Saw. Also send following Peerless Bulletins:
☐ Bulletin MC-51 on new MECHANI-CUT Saw.
☐ Bulletin 53 on Peerless Vertical Saw.
☐ Bulletin HC-50 on Peerless Hydra-Cut.
☐ Bulletins on Stock Rests, Blades and Coolant.

Company .....
Name .....
Street Address .....
City ..... State .....









wisely chosen for this operation since chatter might result if straight tooth cutters were employed.

The cutter setup is very good, the oper-

FOUL COOLANT IS COSTLY

Spoilage means machines must often be cleaned out, new coolant prepared. Then new coolant spoils, cycle is repeated. This is needless waste of precious material, loss of vital man-hours.

Operating costs can be reduced and operators can have clean, decent material to work with through the Dolge Steridol service. Executives in many leading factories have achieved this dual objective which we offer you.



The Dolge approach is to make a competent examination of your particular coolant, to determine whether sanitation is indicated—and if so, what material and method are correct. The particular Steridol recommended is guaranteed to prevent spoilage by maintaining practical sterility when used according to simple directions—without irritating the skin, without corroding metal, without adversely affecting wetting or cooling power.

Let your Dolge Service Man take samples of your coolant for examination on his next call. Complete, confidential report will be submitted promptly without charge.

Free booklet, "Cutting Oil Sanitation," on request.

The C. B. DOLGE co.
WESTPORT CONNECTICUT



STERIDOL

HERE'S YOUR *low-cost* WAY TO TOOL UP FOR No. 0 TO 1" TAPPING

FOR SMALL TAPS
No. 0 to No. 10



ATTACHMENTS
No. 100 No. 200

Ettco-Emrick TAPPING ATTACHMENTS

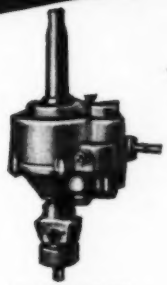
With these comparatively inexpensive Attachments, which you can use on practically any drill press, you are set to handle any tapping in the range of No. 0 to 1" taps.

FOR MEDIUM TAPS
No. 5 to 1/2"



ATTACHMENTS
No. 1-B No. 2-B

FOR LARGE TAPS
1/4" to 1"



ATTACHMENTS
No. 3-B No. 4 No. 5

Exclusive Ettco-Emrick features of design provide all the sensitivity and accuracy any tapping job requires—and at the highest practical tapping speeds.

For full details about these attachments, which have been extensively used throughout industry for over 20 years —

WRITE TODAY FOR BULLETIN No. 2

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn 6, N. Y.

Detroit 1 • Chicago 6

Over 25 years specialization in designing and building drilling and tapping equipment.

POWER FEED For Facing

BORING, TURNING, FACING, UNDERCUTTING COMBINED IN ONE TOOL HEAD

The power feed feature for facing operations insures smooth, uniform movement of tool across work surface. This power feed can be engaged or disengaged instantly. Adjustment of tool for boring is obtained in increments of 1/10,000 in direct reading.



All Operations In One Set-Up

Patent Pending

For Jig Borer, Drill Press, Milling Machine

Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phosphor bronze. Head 3" dia. x 4" long. Wt. 9 lb. Any type shank furnished. Write for complete information.

CHANDLER TOOL CO.
514 OHIO AVE., MUNCIE, IND.

CHANDLER DUPLEX
BORING AND FACING TOOL HEAD

ator having seen to it that the operation is performed as close to the column face as possible. The cutters themselves are rigidly supported to prevent springing the arbor. (Fig. 137).

Rough Mill Vise Jaw Slot

The rough milling of a vise jaw slot in cast iron, is accomplished with two staggered tooth cutters, each 6" in diameter by 5/8" wide. The operation is performed on a No. 3 Plain Horizontal Machine with a spindle speed of 75 rpm. Workpiece is clamped directly to table of the milling machine and is fed to the cutters at a rate of 7⅝" per minute. (Example 138).

EXAMPLE NO. 138

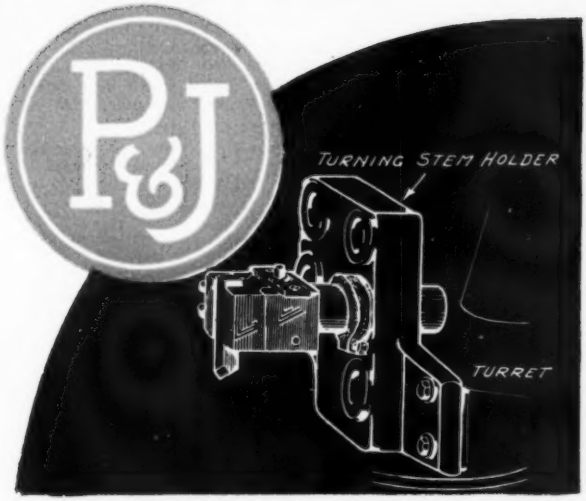
Job Description—	Rough mill vise jaw slot.
Material—	Cast iron.
Machine—	No. 3 Plain.
Speed—	75 rpm.
Feed—	7⅝ ipm.
Production rate—	11 hours/100 pieces.
Fixture—	Clamp to machine table.
Cutters—	Two 6" staggered tooth.

This operation is a good example of proper cutter selection for milling the deep slots in the vise body. Staggered tooth cutters used in this instance break up the chips and thus prevent troublesome pressures building up between workpiece and cutters. Note also that cutters of a large diameter had to be chosen in order that the slots could be milled deeply enough to meet the specifications and still allow for clearance of arbor over workpiece. The setup could have been improved by clamping the work closer to the edge of the table, using the last table T-slot instead of the middle one. The cutters then could have been mounted closer to the column face and the whole assembly made more rigid. (Fig. 139).

Cut Three Rack Teeth

In this operation, three rack teeth are cut in an elevating fork and trip segment with a 2½" high speed form cutter. This workpiece is made of malleable iron and is mounted between a dividing head and tailstock. The spindle speed of the No. 3 Plain Horizontal Milling Machine is 124 rpm and the feed rate, 7⅝" per minute. (Example 140).

By mounting this on a mandrel and locating it between the centers of a divid-



This is one of an extensive series of tools available for Potter & Johnston Automatics. The line includes many effective modern aids to low cost production.

STANDARD MICROMETER TURNING STEM—STRAIGHT

The micrometer mechanism incorporated in this Stem will permit quick and accurate setting of the cutter to the required diameter. Due to the upright position of the cutter and the compact head of the Stem, cuts close to the Stem Holder may be made if the shape of the work makes this necessary. Boring, as well as turning cuts may be made with this Straight Stem. When desirable, a Turning Stem Link (5D, 6D and 8D's) may be used to increase the anchorage of the Stem and the ease of setting the cutting angle of the cutter.

These stems are sturdily constructed of selected and hardened machine steel and bearing surfaces are ground.

A Catalog of essential data

You will find a wide range of efficient modern tooling items in this attractive new catalog if you are a user of P. & J. Automatics. May we send you a copy? There is no obligation.



POTTER & JOHNSTON MACHINE COMPANY

Automatic Machine Tools **PAWTUCKET, RHODE ISLAND**

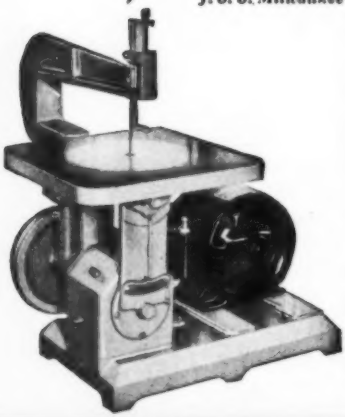
ATLAS DIE FILER

This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.

Complete with motor and saw attachment at

$125.00

f. o. b. Milwaukee



Milwaukee Chaplet and Mfg. Co.

1023 S. 40th St. • MILWAUKEE, WIS.

ing head and a tailstock, the operator can easily index the workpiece to the position of the three teeth on the segment. The selection of a form gear cutter with teeth of the pitch required for the

EXAMPLE NO. 140

Job Description—	Cut 3 rack teeth in elevating fork trip segment.
Material—	Malleable iron.
Machine—	No. 3 Plain.
Speed—	124 rpm.
Feed—	7⅝ ipm.
Production rate—	14½ hours/100 pieces.
Fixture—	Dividing head and tailstock.
Cutters—	2¼" HS form.

workpiece, permits milling of these teeth at one cut. (Fig. 141).

Rough Mill Flat Side of Gib

The final operation in this series calls for the rough milling of the flat side of a cast iron gib. For this purpose a 5" tungsten carbide face tipped mill cutter is mounted on a Style C Arbor and used on a No. 3 Sliding Head Vertical Milling Machine. This 5" cutter revolves at 214 rpm while the workpiece is being fed into it at a rate of 17½" per minute. Two plain vises are employed to hold the work securely. (Example 142).

EXAMPLE NO. 142

Job Description—	Rough mill flat side of gib.
Material—	Cast iron.
Machine—	No. 3 Sliding Head Vertical
Speed—	214 rpm.
Feed—	17½ ipm.
Production rate—	6.4 hours/100 pieces.
Fixture—	Two Plain vises
Cutters—	5" TC face mill.

Several features of this setup and operation are noteworthy. First, this relatively long workpiece is held in two vises bolted rigidly to the table. Any variations in the dimensions of this rough workpiece are compensated for by locating screws seen at either end of the jaws in both vises. The workpiece is first clamped tightly by the two set screws at the extreme ends of the setup. Then when the two remaining set screws in the middle are tightened, they accommodate themselves to the workpiece.

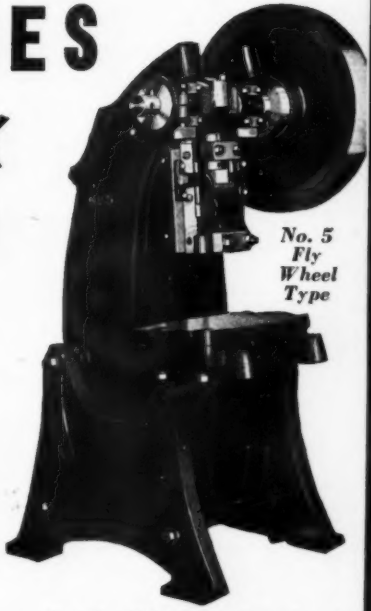
The tungsten carbide tipped face mill cutter revolving clockwise is offset from the center of the workpiece. This is necessary in order to prevent the cutter from tending to carry the workpiece along with it.

★

WHEN EVERY MINUTE COUNTS

MARSHALLTOWN PRESSES

KEEP UP PEAK PRODUCTION



No. 5 Fly Wheel Type

Sturdy, dependable Marshalltown Presses offer you THE MOST FOR YOUR MONEY — they are engineered and built for BETTER PRODUCTION and LONGER LIFE. Among many proven advantages are (1) more die space; (2) chrome nickel cranks; and (3) wrist pin connections. The Marshalltown Line includes inclinable presses from 5 to 70 ton capacity

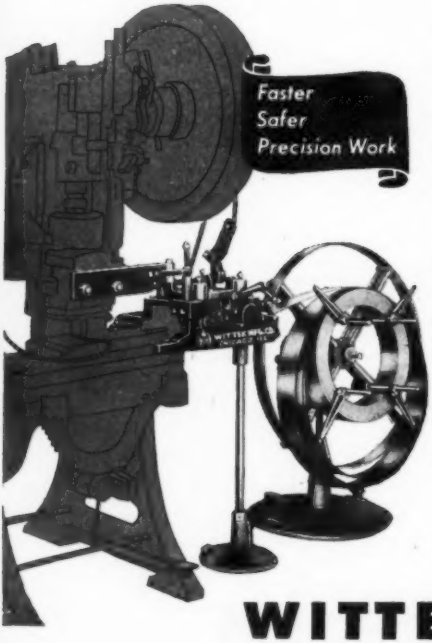
Get the FACTS today about Marshalltown Presses. Send for fully illustrated and descriptive literature.

MARSHALLTOWN MFG. CO.
900 E. NEVADA ST., MARSHALLTOWN, IOWA

Planning Peacetime Production Using Coiled Strip Stock?



Equip with
WITTEK
Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

Write for catalog, prices and recommendations

WITTEK
MANUFACTURING CO.
4305-15 West 24th Place, Chicago 23, Ill.

Automatic
ROLL FEEDS
AND
REEL STANDS



"Aces" for Production!

Blu-Mol Hacksaw Blades by Millers Falls have won many a production battle with their extra toughness and extra lasting qualities.

For hand sawing the nine types of Blu-Mol Single-Edge Blades meet every requirement for a blade that can "take it."

For extra-heavy duty, continuous-production power sawing, the six sizes, embracing a total of 24 types, meet every demand for a blade that will cut the toughest steel.

Double Life — 1/4 Lower Cost

Under proper supervision of cutting conditions, nothing can equal the now famous BLU-MOL DOUBLE-LIFE blade for low hack-sawing costs. With its two cutting edges, it costs 25% less than two molybdenum highspeed blades, and 47½% less than two tungsten high-speed blades.

For every sawing need, specify Millers Falls blades.

MILLERS FALLS TOOLS
SINCE 1868

BLU-MOL HACK SAW BLADES

MILLERS FALLS COMPANY
Greenfield, Massachusetts

PRECISION CENTERED EYE BENDING

with

DI-ACRO BENDERS

DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

Send for Catalog

"DIE-LESS" DUPLICATING

showing many kinds of "DIE-LESS DUPLICATING" produced with DI-ACRO Benders, Brakes and Shears.



See DI-ACRO Exhibit
NATIONAL METAL CONGRESS
Cleveland, Oct. 16 - 20

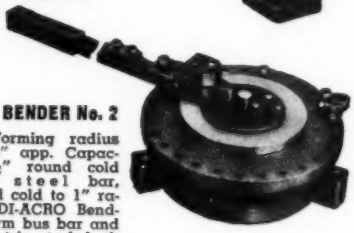
A Centered EYE in 1 Operation

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at a high rate of production. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

BENDER No. 1

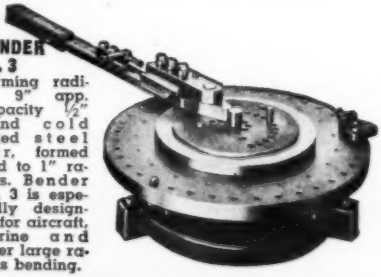
Forming radius 2" app. Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.





BENDER No. 2

Forming radius 6" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edge-wise.



BENDER No. 3

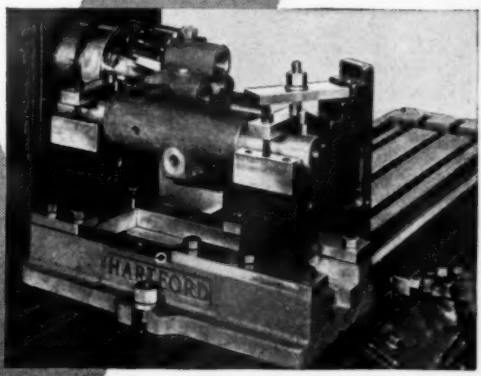
Forming radius 9" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. Bender No. 3 is especially designed for aircraft, marine and other large radius bending.

Pronounced "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

314 8th Ave. S., Minneapolis 15, Minnesota



The HARTFORD V-BLOCK FIXTURE...

Saves Time on **MILLING BORING and INSPECTION** ***SET-UPS***

This versatile V-Block Fixture provides a practical and convenient method for locating and holding a wide variety of irregularly shaped work.

Overall length of the fixture is 15⅞"; overall width 9¼"; height to top of V-Block 7⅝"; maximum arbor diameter 2¼"; maximum distance between V-blocks 10"; net weight 80 lbs.; shipping weight approximately 100 lbs.

This sturdy Hartford V-Block Fixture with its simplicity of design and construction, coupled with its ability to speed up the toughest set-ups, is a worthwhile investment for any machine shop.

Prices and delivery dates on request.

THE HARTFORD Special Machinery Co.

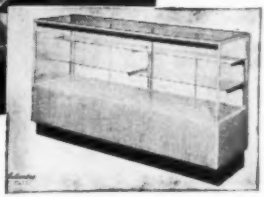
HARTFORD 5, CONN.

Increase Your RIP SAW *Production*



Columbus Show Case Co. uses Carter Guide-Line Light with a Mattison "202" Rip Saw

Essential to manufacture of Fine Show Cases is accurate, economical, rapid rip-sawing.



Carl B. Icenhower, Superintendent Columbus Show Case Company, Columbus, Ohio,

recently wrote:

"For some time now, we have been using a Carter Guide Line Light. The use of this light speeds up the amount of lumber an operator can rip, and the amount of waste is substantially reduced.

"We have had considerably less rejected stock after it leaves the rip saw, since we have been using this light.

"This light enables the ordinary sawyer with limited experience to produce more usable stock, with less waste, than the highly skilled sawyer who has had years of experience can produce without the aid of this light.

"We are pleased with the operation of the Carter light and would not be without it."

FEATURES which *Benefit* You!

1. Saves Valuable Lumber
2. Increases Output
3. Reduces Waste
4. Can be Operated by Limited Experience Sawyer
5. Simply Constructed
6. Costs 1c per hour for electricity
7. Used by furniture plants, ship-yards, box makers, general lumber, plywood and plastics shops

CARTER
PRODUCTS COMPANY

204 North Division Bldg., Grand Rapids 2, Michigan

Band Saw WHEELS • TIRES • GUIDES • GUIDE LIGHTS

1944 METAL CONGRESS

MORE than 300 manufacturers and organizations serving the metal industry are scheduled to participate in the War Conference Displays and National Metal Congress scheduled for the week of October 16th in Cleveland's Public Auditorium.

Reconversion problems are drawing closer and closer with the concluding phases of the war in Europe. The Cleveland displays and meetings of the several technical societies will afford an unparalleled opportunity for comparing notes and perfecting postwar plans. The adjustments confronting the metal industry today can best be met by getting together to take stock of the advances that have been made during the war years. Some sections of the metal industry may be converting at least part of their production to civilian market in the not too distant future. Nowhere outside of the Metal Congress is there a common meeting place where such a huge section of the metal industry can get together.

The Metal Congress is sponsored by American Society for Metals in cooperation with the American Welding Society, the Iron and Steel and Metals Divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial Radium and X-Ray Society and the Society for Experimental Stress Analysis.

Technical sessions will be held each morning, afternoon and evening during the Congress with nearly a thousand metal experts collaborating in the preparation and presentation of some 150 lectures. In addition to the technical reports on research developments of the past year, the American Society for Metals will present a series of practical panel-type production meetings each afternoon and evening with the exception of Thursday evening when the annual dinner will be held.



New, But Proven!

Do three different jobs at once — any size hole up to 1". Three separate motors — *three tapping machines in one!!!* Either single or continuous cycle. Positive feed by husky lead screw prevents tearing of threads. Safe—no jamming of work. Ample tanks for coolant and hydraulic oil (no gushing). Ready accessibility.

Get new Bulletin "B"

D. H. PRUTTON MACHINERY & TOOL COMPANY
5293 West 130th St.
CLEVELAND 11

A quiet place to telephone in noisy factories



Now available . . .
Subject to prior sale

Don't let factory noises interfere with your shop phones. Install a Burgess Acousti-Booth and hear conversations clearly. Sound absorbent walls of patented acoustic construction provide a remarkable "zone of quiet". . . without doors. Airy and easy to keep clean . . . no mechanical parts to get out of order. Limited numbers of Burgess Acousti-Booths are available for immediate delivery. Send coupon for free illustrated booklet.

Mail Coupon for Free Booklet Today!

Burgess-Manning Company
2817-D W. Roscoe St.
Chicago 18, Illinois

Please send illustrated booklet describing the Burgess Acousti-Booth.

NAME .....

FIRM NAME .....

STREET-CITY .....

Some of the specific subjects for discussion during the five day sessions include: — Metal powders and products; metals for railroads; metallurgical furnaces; induction heating; heat treatment; manufacture of quality steels; national emergency steels; surface peening; foundry metallurgy; quality control by statistical methods; salt baths; sub-zero treatments; surface finishes and protection; new developments in the study of corrosion; application and use of quality control instruments; tin and tin alloys; aluminum; magnesium; metal cutting and tool materials; tools for inspection; lightweight construction, etc.

ELECTRONICS TRAINING COURSE

Designed to give in a clear, understandable manner the basic principles and applications of Electronics in industry, a new 10-part training course covered by sound slide films, lesson books, quiz books, and an instructor's manual has been prepared by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Altho designed primarily for Westinghouse employes, the material has been made available to others at reproduction costs because of many requests from engineering groups and individuals interested in Electronics.

Sound slide films and records for the 10 lessons give clear, visual explanations of basic theory and applications. Ten lesson books in handy pocket size, reproducing the subject matter of each lesson, are provided for each member of the class. These afford a convenient means of review and supplemental study. Pictorial quiz books are supplied for midcourse and final review of the subjects covered, and an instructor's manual giving suggested classroom procedure is provided with the complete course. Informative booklets on industrial electronic equipment are supplied covering ignitron rectifiers, high-frequency heating, resistance welding, power line carrier, rototrol, sealed ignitron, and electronic tube data sheets.

RZEPPA BULLETIN

An attractive new 12-page bulletin has been issued by Gear Grinding Machine Co., Detroit, 11. It presents many illustrations and detailed descriptions of designs and applications of Rzeppa Universal joints. All of the component parts are illustrated adequately and there are numerous pictures of outstanding applications.

WHY THE *Staples* EXPANSION REAMER HAS LONGER LIFE

The Staples Expansion Reamer greatly outwears competitive reamers because after expansion it will still produce holes of precision accuracy without regrinding!

This saving of tool life results from the patented, exclusive Staples method of expansion. The full length of the tool tip is expanded outward uniformly. Each expansion further tilts the blades, presenting in effect a new cutting edge and reducing regrinding to a minimum.

Staples Precision Carboloy-Tipped Expansion Reamers and other cutting tools have been used for years in the aircraft engine industry, where utmost accuracy is a prime requisite. Now, due to increased production, we can offer these tools affording aircraft accuracy to other industries which appreciate the many advantages of using today's highest quality cutting tools.

Send for our Catalog No. 44, describing Staples Tools, and containing comprehensive data on reamer usage and design.

STAPLES TOOL & ENGINEERING COMPANY
CINCINNATI 25, ... OHIO



Staples **CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS**

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS
SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

PRODUCTION?

. . . *that's up to me!*

And, here's why I get more production at less cost . . . by using STADOIL DIAMOND LAPPING OIL only. This is one lubricant that gets results on Diamond Wheels . . . Prevents the loading and glazing of your wheels, and there's no pressure required in using STADOIL on your wheels or laps.

You, too, can increase YOUR production by using this oil, the oil made especially for this purpose.

Carbide Tool Manufacturers and Diamond Wheel Manufacturers or their representatives will quickly attest the value of STADOIL to you.

- Economical to Use.
- Immediate Shipments.
- Cheaper in the Long-run.

Stadoil Manufacturing Company

617 S. Beacon St.
Dallas 10, Texas

3221 S. Figueroa St.
Los Angeles 7, Calif.

JOBBERS OF INDUSTRIAL & MILL SUPPLIES: There is business right on your doorstep on this product. Amazing repeat business and PROFIT.





Barker Wrenchless Chuck—three-jaw type.



Barker Wrenchless Chuck—two-jaw type.

1/3 More Parts WITH A BARKER WRENCHLESS CHUCK

Pieces-per-hour went up and stayed up when this P & J Automatic Lathe was equipped with a Barker Wrenchless Chuck. Top output before the change was 18 pieces—the Barker Chuck stepped up production to 24 pieces—an increase of one-third. This user operates six Barker Chucks that are giving uniformly efficient service.

Continuous generous dividends in time saved and increased production are being earned by the hundreds of users of Barker Wrenchless Chucks. Are you interested in similar results?

Write today for full information.

THOMAS HOIST CO.

Chuck Division

20 South Hoyne Avenue, Chicago 12, Illinois

Typical Results Attained by Plunge Grinding Threads and Forms with a Crusher Dressed Wheel

SHOCK ABSORBER



This part consists of two steel tubes bonded together with rubber. The outer tube is SAE-1015 steel, .093" thick with a ½" threaded section on one end—threads 2⅛"—16N-3. These threads are plunge ground in a fraction of the time without the generation of the high heat inevitable with the single point wheel which caused tube and rubber to separate.

IMPELLER SPACER



This spacer, 2.223" long is ANS-6294 steel, case hardened to 81-84 Rockwell A, and has a .010" of stock removed from each side and bottom of the grooves. Plunge grinding these grooves with a multiribbed wheel is accomplished in one-sixth the time it takes to grind them with a single point wheel.

GOVERNOR PISTON



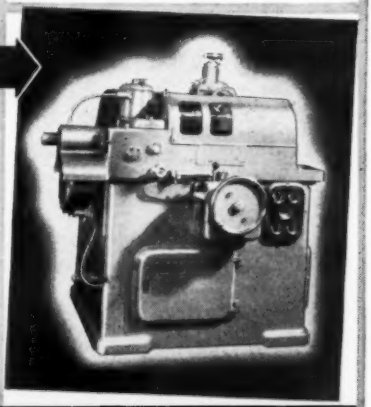
This piston, 1.591" long, is chrome-molybdenum steel 26-36 Rockwell C. Plunge grinding takes .005" from the outside of four shoulders leaving sharp corners. Production rate by plunge grinding is ten times as fast as it is by older methods.

PROPELLER STUD



This stud is chrome-molybdenum steel 32-36 Rockwell C. The threaded section, 11/16" long (⅞"—20NF-3), is plunge ground in one-third the time required by conventional grinding.

Parts shown have been processed on the Sheffield Precision Thread and Form Grinder under normal conditions.
This machine, using a crusher dressed multi-ribbed wheel, plunge grinds single- or multi-start threads, eliminating thick first and last threads. It plunge grinds forms of almost any contour. It is also used to traverse grind single- or multi-start threads with a multi-ribbed wheel or it may be used with the conventional diamond dressed single point wheel.
Write for data on this process—Bulletin M-100-144.



THE
SHEFFIELD CORPORATION
Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

Let's Talk Shop

SHARPENING CUTTERS FOR HIGH SPEED CARBIDE MILLING

This material has been supplied thru courtesy of Cincinnati Milling Machine Co., Cincinnati, Ohio. The recommendations given here by their Committee on Cutter Sharpening, are in accord with their own present practice, which has been found satisfactory in regular production work. It might be emphasized that the Grinding of Carbides, like the entire High Speed Carbide Milling Program, is rapidly and continually undergoing improvements. As changes of methods develop and survive, we shall endeavor to pass them on.
The sentences printed in bold face type represent marked departures from, or improvements over previous recommendations. (The Editor).

General Recommendations

A SEPARATE department under the strict supervision of a carbide grinding specialist should be set aside if possible for the exclusive grinding of carbide milling cutters.

Cutters should be individually stored in sturdy wooden boxes of ¾" lumber large enough for each cutter to clear the sides of the box.

The serial number, manufacturer's carbide type number, axial rake angle, and radial rake angle should be stamped on each cutter. It is also well to attach to the box an instruction card which gives the corner angle, primary clearance angle, concavity or face relief angle, roughing wheel grit, finishing wheel grit, and hand hone grit.

If the machines are available, considerable set-up time can be saved by leaving one machine set up for circle grinding, one for grinding the tooth face, and one or two for grinding the clearances.

General Instructions

1—Diamond wheels of 100 concentration should be used exclusively for grinding of carbide tips. At present we recommend resinoid bond diamond wheels. However, wheel manufacturers have recently announced a new vitrified bond for diamond wheels. Recommendations concerning this type of wheel will be reported later.

a.—Use 100 grit straight wheels for **circle grinding.**

b.—Use 100 grit cup wheel for general

Check These Advantages

L-R FLEXIBLE COUPLINGS

Today's improvements. Send for Catalog with Selector Charts for quick-finding of couplings for your services —anything from 1/6 to 2500 h.p.

LOVEJOY FLEXIBLE COUPLING CO.
5026 West Lake Street, Chicago 44, Ill.



Pat. & Pats. Pend.

√ Most quiet couplings.

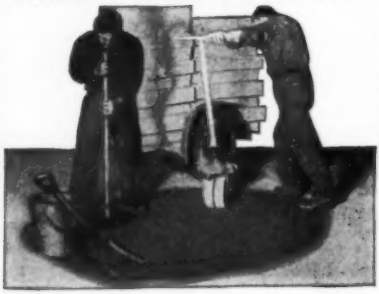
√ Positive correction for misalignment, shock, vibration.

√ Non-Lubricated.

√ No shut-downs for changing.

PATCH FLOORS

WITHOUT HALTING TRAFFIC

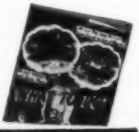


No longer is it necessary for the busy plant to close off an area of concrete floor while waiting for newly installed patches to set. Flexrock offers a new plastic repair material which is ready for traffic almost the moment it's put down. Simply shovel INSTANT-USE into the hole or rut—tamp—and your floor is restored to solid smoothness . . back in service without delay. Tough INSTANT-USE bonds tight to old concrete, makes long-lasting heavy duty patch. Withstands extreme loads. Keep a drum on hand for emergencies. Immediate shipment.



Request Descriptive Folder . . . and Details of

FREE TRIAL OFFER



INSTANT-USE

FLEXROCK CO.

3634 Filbert St., Philadelphia 4, Pa.

Please send me complete INSTANT-USE information . . details of FREE TRIAL OFFER —no obligation.

Name .....

Company .....

Address .....

roughing where more than .002″ stock has to be removed.

c.—Use 180 grit cup wheel for finishing face of tooth and for grinding secondary clearance.

d.—Use 400 grit cup wheel for finishing primary clearance lands.

2—If the cutter has been originally designed so that there are sufficient wheel clearances, with the carbide tip projecting .040″ to .060″ beyond the cutter body, it should never be necessary to grind into the body of the cutter. When the carbide is ground to such an extent that the diamond wheel interferes with the body, the carbide tip should be set out again or replaced. Under no circumstances should a diamond wheel grind into the cutter body.

3—A cutting speed of 5000 to 5500 ft. / min. is recommended for the diamond wheel.

4—In roughing, remove no more than .0004″ per pass, in semi-finishing no more than .0002″ per pass and in finishing no more than .00015″ per pass.

5—The tip should be fed past the wheel at a rate of about 50″ per minute in roughing and about 10 to 20″ per minute in finishing.

6—The rotation of the wheel must be toward the cutting edge, i.e., when grinding the clearance land the abrasive grits must first strike the cutting edge.

7—In circle grinding, soluble oil and water (1:90) should be used as a cutting fluid and can be applied by means of a felt pad contacting the wheel. In roughing and finishing with cup wheels, the wheel should frequently be wiped clean with a rag saturated with kerosene. If the wheel should load up or if the bond should burn, the wheel can be opened with a pumice stone or with a dressing stick especially made for diamond wheels. The pumice stone is best for finishing wheels and the dressing stick for roughing wheels. In any case dressing should be done carefully to avoid undue loss of diamond particles. Roughing wheels are

Speed FROM ALL DIRECTIONS

The Bodine is a "process" rather than an "operational" machine tool . . . it moves the work through several different operations, automatically. This principle helps manufacturers to reduce costs . . . the idea behind all Bodine designing . . . a necessity if war-plants are to regain their pre-war markets.

DRILLING, MILLING, TAPPING, SCREW INSERTING

The basic principle of Bodine machines combines an automatic horizontal indexing table with 6 to 8 spindles, located at will and tooled to perform operations in sequence as the parts move to working stations. The operator merely places the part in a clamping fixture . . . removes it when the cycle is completed. Often ejection is automatic . . . sometimes hopper feed is practical. In any event, operators are quickly taught to attain, and maintain, high speed production. Extreme accuracy is inherent in the machine itself.

THIS IS WHY YOUR COSTS ARE LOWER

1. Six to eight different operations are performed on each part (if desired) during single cycle of the dial.

2. Spindles may be located to operate vertically, horizontally, at an angle, or inverted . . . each at different speed . . . to 20,000 r.p.m.

3. Electrical safety interlocks minimize tool breakage, protect work and machine - - - protect the operator.

If you are not a Bodine machine owner . . . send for Bulletin . . . ask for full information

Production requirements in this critical war year are shifting men from non-essential to essential work. Most of them are not mechanically minded. Disabled veterans can readily operate Bodine machines.

It is the responsibility of war plant management to make them productive employees as quickly as possible . . . so we suggest that you train new men (and women) to operate the Bodine machines you now have. This procedure may permit advancement of your older, more experienced operators to more difficult jobs . . . for improved all-around production.

Bodine operators clearly see how well they fit into hi-speed war production . . . are contented with their effort to help win the victory . . . and the low fatigue factor and clean, healthy work are major contributions to the defeat of absenteeism.

6 STANDARD SIZES

The six standard Bodine machines range from the No. 40-10 to the larger No. 48-30 and require floor space from 54"x60" to 90"x96". They accommodate from 6 to 8 spindles . . . can be adapted for a great variety of tooling set-ups. (No. 48-30 shown processing armament components.)



DOUBLE YOUR PRODUCTION NOW

and Be Equipped for Postwar Competition

***with* E. Z. 2-SPEED**

FRICTION CLUTCH

COUNTERSHAFT



Gives instant speed change on Logan, Atlas and other bench lathes . . 2-speeds forward or forward and fast reverse for tapping, reaming, etc. Price complete, $75.00. Installed in 30-minutes.

E. Z. DRILL GRINDING ATTACHMENT

Sharpens drills in one minute to original factory accuracy. Handles 3/32" diameter minimum, 1" diameter maximum. Thousands used by larger and small war production plants. Type 1 — $5.95; Type 2 — $7.95. Let us send full details.

IMMEDIATE DELIVERIES

DEALERS WANTED

E. Z. MANUFACTURING CO.

1709 W. 8th St., Los Angeles 14, Calif.

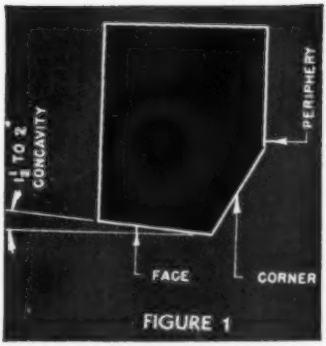


FIGURE 1

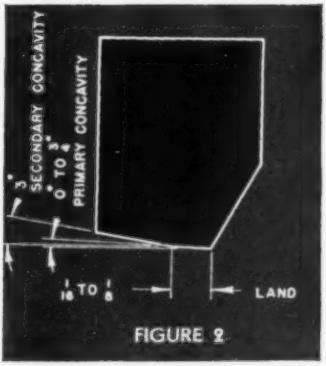


FIGURE 2

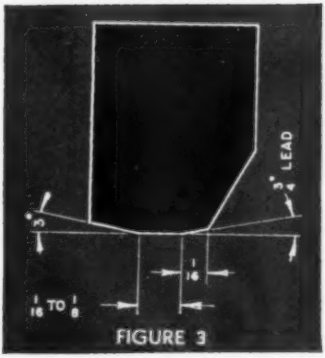
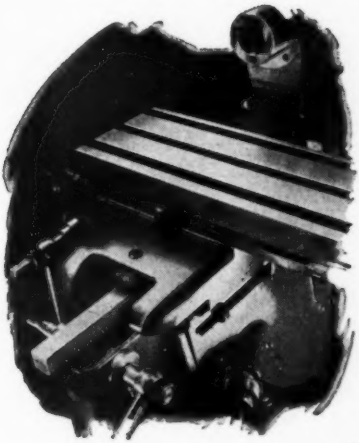


FIGURE 3



LATHE CARRIAGE FLEXIBILITY

KEEPS NICHOLS MILLERS BUSY





Precision turning, boring, recessing, jobs you'd normally assign to toolmaker's lathes or expensive boring machines, come natural to Nichols Millers.

Lever-Rack-and-Pinion Transverse Feed is the answer. This exclusive Nichols development assures the *extra utility* that makes the Nichols Miller *different* from conventional hand millers. It adds lathe-carriage flexibility to your most intricate machining operations while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

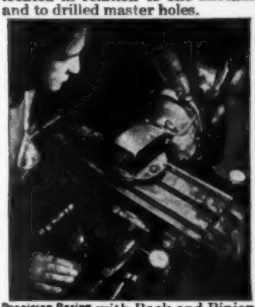
Simple fixtures, made possible by the rise-and-fall spindle, reduce set-up time, even in the hands of semi-skilled operators on production lines, in toolrooms and laboratories.

Send for new illustrated brochure.

ALL NICHOLS MILLERS ALL DIFFERENT JOBS



Milling Two Slots inside a Ring, accurately located in relation to one another and to drilled master holes.



Precision Boring with Rack and Pinion transverse feed to a ±.0002" tolerance on a 3" diameter.



Reaming Two Holes to ±.0005" location with two rack and pinion feeds and a quick-action work holder.

THE NICHOLS MILLER

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

NAT'L DISTRIBUTORS: NICHOLS-MORRIS CORP. • 42A CHURCH ST., NEW YORK 7 • *Dealers in all principal cities*

RECOMMENDED CLEARANCE ANGLES

Type Mill	Primary Clearance Angles (Degrees)								
	Periphery			Corner			Face		
	Steel	C. I.	Alum.	Steel	C. I.	Alum.	Steel	C. I.	Alum.
Face or Side	4-5	7	10	4-5	7	10	3-4	5	10
Slotting	5-6	7	10	5-6	7	10	3	5	10
Saw	5-6	7	10	5-6	7	10	3	5	10

Maximum Usable Length of Primary Clearance Land on Periphery and Corner: is a function of the cutter diameter, clearance angle, and feed per tooth. A 1/2" land is suitable for general work with cutters 3 to 8" in diameter.

Secondary Clearance Angle on periphery and corner may be 3° to 5° more than the primary clearance.

Length of Primary Clearance Land on Face of Cutter: on face of cutter the primary clearance may, in general, extend over the entire tooth.

more apt to burn, while finishing wheels have the greater tendency to load up.

8—An 18 power watchmaker's magnifying glass should be used by the grinder operator to examine the carbide both before grinding and at intervals during the grinding operation. All cracks and flaws in the carbide should be ground away in the roughing operation. All the crater and abrasion marks produced in cutting must



NO BUCKING -NO BREAKING

Paddock Ballbearing Band Saw Guides

Eliminates most of the blade breakage. Increases Band Saw Machine Production.

Designed for hard continuous service in several sizes and models—recommended for new and old machines running at any speed. Holds working portion of the blade as if it were in a frame. Assures perfect operation under all conditions.

Ball Bearing Wheels of the same size are interchangeable to any position on the guides—in effect three sets of Guides in One. WITH PADDOCK GUIDES GET MORE WORK DONE. Complete Information on Request.

PADDOCK TOOL COMPANY

Guide Makers Since 1920

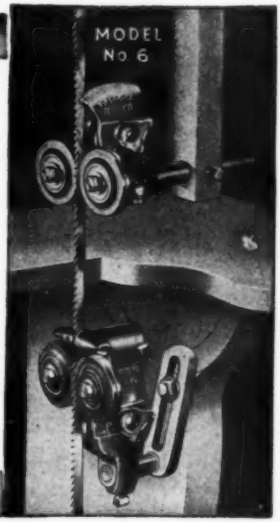
1418 Walnut Street Kansas City 6, Missouri

Paddock

BALL-BEARING

BAND SAW GUIDES

Guided and Guarded by 6 Safety Points

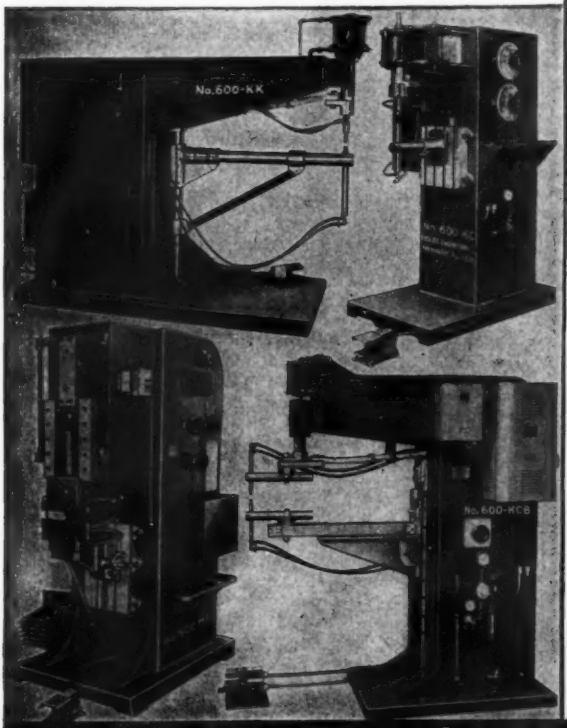


WELDERS
SPOT · BUTT · ARC

We manufacture a complete line of resistance spot welders from 1/4 to 300 KVA for all types of welding. There is an EISLER WELDER for every purpose.

WRITE FOR CATALOG

WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.





ARC WELDERS
100 TO 400 AMPS.



BUTT WELDERS



FOOT
AIR
MOTOR
OPERATED

SPOT WELDERS



PRESS
TYPE

SPOT WELDERS
FOOT, AIR
OR MOTOR OPERATED

CHAS. EISLER
EISLER ENGINEERING CO.
762-SO. 13th ST. Near AVON AVE NEWARK N. J.

CONCAVITY, OR FACE RELIEF, ON FACE OF CUTTER:

Condition	Concavity Angle	Fig. No.
For long tool life	1½° to 2°	1
For good work finish	½° to ¾°	2
For fine work finish	0° land, 1/16″ to ⅛″ long	2
For fine work finish where chatter is encountered	¾° x 1/16″ lead plus 0° land, 1/16″ to ⅛″ long	3



CUB

VARIABLE SPEED TRANSMISSION

For "A" section V-belts—3.3—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. *See your dealer or write* $16.50

(3 Types—8 sizes to choose from)

Standard Transmission Equipment Co.

3409 VERDUGO ROAD LOS ANGELES, CALIF.

be removed in grinding or the cutter life will suffer.

9—After grinding, the teeth should be indicated for run out. In addition, the clearance and body interference should be carefully checked. These latter two steps are especially important for small diameter cutters and for radius cutters.

10—The face and clearance lands should be carefully honed with a 400-500 grit diamond hand hone after the diamond grinding. In addition, the cutting edge should be broken with this hone approximately .002″ at 45°. The surface finish on a carefully ground and honed tooth should not be more than about five micro-inches, rms; experience has shown that the better the finish, the longer the cutter life.

11—The cutter should be carefully inspected with an 18 to 40 power microscope on a well-illuminated inspection bench before final release.

12—During grinding, hold cutter in same manner as it will be held in the milling machine, i.e., grind side mills on a mandrel; bolt face mills against the face of a face mill arbor, etc. Shell end mills should remain on their arbors during grinding.

13—Properly used carbide cutters can be reconditioned by removing .003″ to .005″ from the tooth face and .004″ to .006″ from the clearance lands. If more stock has to be removed, then the cutter has been used too long or the cutting conditions are not correct.



WESSON VISE
makes ANY operator an EXPERT





Difficult angle set-ups can be made quickly . . . in a fraction of the time ordinarily required. Compact size, lowest overall height, ability to work in close quarters, and wide range of capacity permit many adaptations to standard machines . . . you multiply the uses of machine tools with WESSON Vises. Two sizes. See nearest distributor, or write for bulletin. WESSON PRODUCTS CO., 710 Fisher Bldg., Detroit 2, Mich.

Don't let those "manpower blues" get you down when you have precision angle milling to do! Remember . . . WESSON Vises are immediately available. You can get *them* on the job, fast! And any operator can do *expert* precision angle milling, drilling, grinding, reaming, slotting, or what have you . . . with WESSON Universal Vises. Rugged and rigid, free from "chatter," these vises permit high speed precision-production or tool room service, and save time and money.

WESSON
Universal **VISES**
BUILT TO WESSON STANDARDS OF QUALITY AND PRECISION

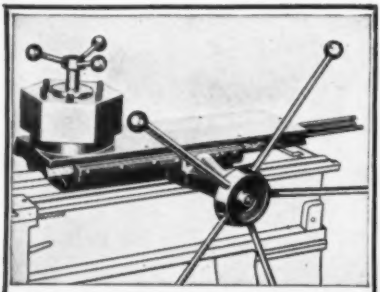
WESSON PRODUCTS CO., Dept. MT-10
710 Fisher Bldg., Detroit 2, Michigan

Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

Name and Title.....

Firm Name .....

Address..... City & State.....



LYNN HEAVY DUTY, Self-Indexing **CONVERSION BED TURRETS**

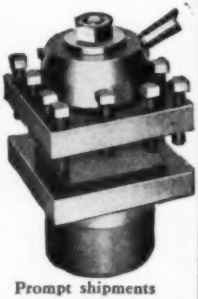
Do turret work on your engine lathes! LYNN turret equipment gives you *immediate conversion.* Easily, quickly mounted on idle or unproductive lathes, enabling them to handle multiple operations rapidly on a wide range of work. Bed Turret models for lathes of all sizes and makes.

LYNN BT-3 (above), Heavy, Duty, Self-Indexing Bed Turret, for large engine lathes up to 28" swing. 9⅛" hex head, 10" travel, 6 positions. Equipped with special adjustable base. Also practical for *replacements* on standard turret lathes.

New Precision Model T. P. Turrets

Self Indexing ***Working Parts Enclosed***

For lathes from 9" to 30" swing. Both tee bolt and bolt circle mounting for all types of screw machine and turret base mountings. Performs 4 separate operations in succession with one setup. Sizes: 3¼", 4¼", 5¼", 6½", 8".



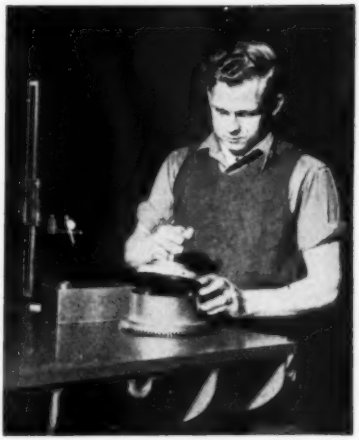
Write for catalogue

Prompt shipments

LYNN MANUFACTURING CO.

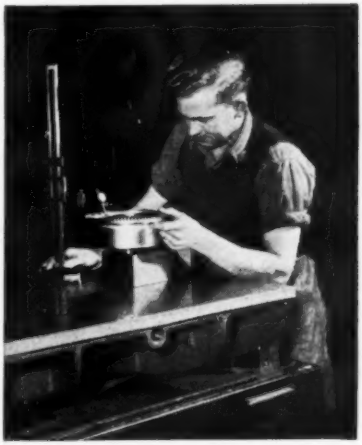
218 Elroy Street **Minneapolis 8, Minn.**

CONCENTRICITY CHECKS



Operator fitting stud into bore to be checked.

A fixture for testing concentricity of bores, devised by M. S. Anthony, a general foreman at General Electric's Pitts-



Checking concentricity of bore. Dial indicator on standard is alternative to using post in block.

SPEED - ACCURACY - on 95% of All Cut-off Work

KALAMAZOO METAL CUTTING BAND SAW



DRY MODEL —
Machine illustrated is suitable for all intermittent cutting. All models portable and plug into light socket. Casters optional.

WET MODEL —
Machine with coolant permits high speed, production cutting. Attachment operates clean and does not interfere with convenience or portability.

★ **Does most of the work of large, high priced machines.**

Quick set-up — automatic operation — continuous cutting — and precision, wafer-thin cuts. Produces MORE WORK — BETTER WORK and SAVES LABOR and MAINTENANCE.

If you are cutting bars, angles or tubes to lengths, this is the NEW, MODERN, ECONOMICAL METHOD.

Low cost recommends it for SAVINGS and EFFICIENCY on hundreds of jobs.

Two sizes — 8" x 16" and 8" x 24". Four speeds for any metal.

Write for Bulletin or Ask your Dealer!

MACHINE TOOL DIVISION

KALAMAZOO TANK & SILO COMPANY - Kalamazoo, Mich.

field Works, is simpler, more accurate, and 100 per cent faster than checking them on a lathe. The fixture consists essentially of a machined cast-iron block with a 1½" hole at one end to accommodate bushing to take various diameter adapters required for the bores. A ⅝" reamed hole at other end of the block supports a post on which an adjustable indicator arm is clamped.

A hardened ground and lapped bushing pressed into the 1½" hole provides a bearing support for the adapters. The bushing and adapters have a ground 30° seat to simplify alignment. Diameter of the adapters is held to within 0.0001" of the lower limit of their respective bores. To use the fixture, the operator either fits part over the adapter, or the adapter into the part. Concentricity of bore is checked easily by positioning dial indicator and rotating part.

The previous method of checking the part on a mandrel between lathe centers with the dial indicator held in the tool post was always complicated by the tailstock.

"ROLL OUT THE BARRELS"

A simple appliance for up-ending filled steel drums—a common industrial task involving injury hazard—has been devised by Alvin H. Potter, a still operator in the sludge recovery operations of the Du Pont Co's, Finishes Plant in Toledo.



Several Up-Enders have been in use for a considerable time in Du Pont plants with such success that the company is offering descriptive details in the general interest of industrial safety.

Meet Today's Requirements

with a

Properaire

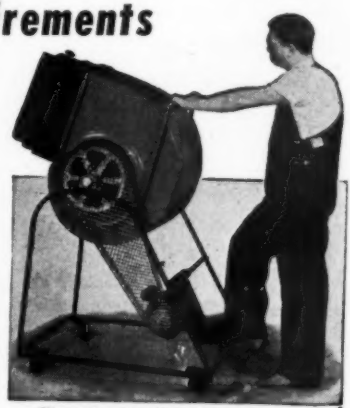
INDUSTRIAL

UTILITY BLOWER

● Directing an air-flow as easily as directing a spot-light, this Properaire Blower offers a multitude of uses, such as heating, cooling, ventilating, drying, fume and dust removal. Meets temporary situations.

● It is but one of several multiblade blowers and propeller fan air-movers in our line. Prompt delivery.

For New, "BLOWER DATA" File, FREE, Ask your jobber or write to



Changing Air Flow as Easily as Directing a Spot Light.

GRAND RAPIDS DIE & TOOL CO.

1210 Godfrey Avenue **Grand Rapids 2, Mich.**

MODERN
SELF-OPENING STATIONARY TYPE
DIE HEADS

Whatever your threading problem, MODERN has the practical, economical solution.



MODERN Self-Opening Die Heads thread diameters from ⅛" to 7" in standard heads and up to 14" in special heads, accurately, fast, and economically. Standard die heads and standard chasers can usually be shipped from stock. MODERN is prepared to meet your die head requirements for large and small threading, and do it with satisfying promptness. Write for Bulletin M-123.

MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK



SEE BETTER • WORK BETTER •

Keep hands free

CARL ZEISS INC.

2¼x HEADBAND MAGNIFIER

Use of both eyes reveals true depth of details. Magnification of 2¼x. Free working distance, 8" to 10", permitting unhindered use of hands. By just lifting your head, your eyes are free for any other activity. Eyeglasses may be worn while using. Highest optical quality. Eyeshade of Tenlite—practically unbreakable. **Write for leaflet.**

CARL ZEISS, INC.

Dept. H55-10, 485 5th Ave., New York 17, N. Y.



Abart

EXPERIENCE AND FACILITIES

Use these strong "lines" to harness your power to efficient speeds.

ABART SPEED REDUCERS

Widest range of ratios, flexibility, adaptation to all input and output conditions. Worm, spur and combinations to 400 h.p. Send for Catalog.

Abart Gears. To specifications. *Ask for estimate.*

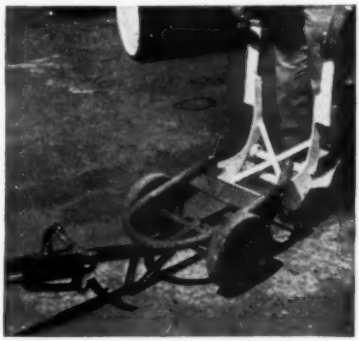


ABART GEAR & MACHINE CO.

4832 W. LAKE ST., CHICAGO 50, ILL.

The appliance fits over the metal runners of a Colson-type barrel truck, requiring only a few seconds to fix in position. Alterations can easily be made to adapt it to other types of hand trucks. The Up-Ender can be made from supplies usually to be found in a plant repair or machine shop, cost of labor and materials amounting to about $15 per unit.

One man employing the device can easily tip on end a 650-pound drum from a horizontal position and two men can easily up-end a 900-pound drum.

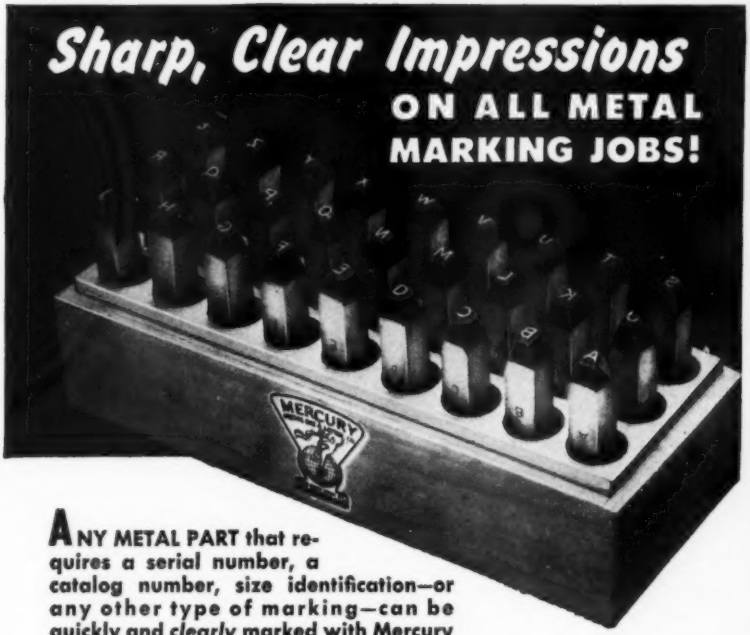


The labor-saving device consists of two 12" lengths of 1½" steel pipe which fit over the metal runners of a Colson barrel truck. These two pipes are reinforced with a welded curved metal strip, cross braced with each other. The curved metal strip is notched at the ends and these slide around axle of the Colson truck as the device is slipped over drum runners. For additional strength and provision for increased lift facilities, two sets of steel rollers or solid wheels are attached at the curvature of the reinforcing strips.

Ends of the lift pipes are flattened out to a rectangular shape so as to fit over truck runners. Opposite ends of the pipe —the free ends, which come in contact with side of drum—are similarly shaped but at an approximate 45° angle in order to conform to contour of drum. A solid steel bar, with a ¼-⅜" lip leveled off, is welded to extremity of pipe, to afford a better grip to the drum chime.

More detailed information may be obtained by writing the Du Pont Finishes Division, Wilmington 98, Delaware.

Sharp, Clear Impressions
ON ALL METAL MARKING JOBS!



ANY METAL PART that requires a serial number, a catalog number, size identification—or any other type of marking—can be quickly and *clearly* marked with Mercury Steel Letters and Figures!

These Stamps are made of the finest carbon steel to protect against breakage and give you years of service on all part marking work. The letters or figures are deep cut with sharp faces for ease of stamping on even the hardest metals. Accurate bevel further assures clear impressions, and aids in alignment. The husky steel body is amply large to withstand severest use.

A large stock of Mercury Steel Letters and Figures in sets and sorts is available in sizes to meet a complete range of metal marking needs. Special sizes can be made to your specifications, if desired. *Write Dept. B for complete details, and briefly outline your marking problem for our recommendation on the Mercury Stamps to meet your needs!*

Metal Marking Tool Specialists for Over 25 Years

MERCURY METAL DIE AND LETTER CO.

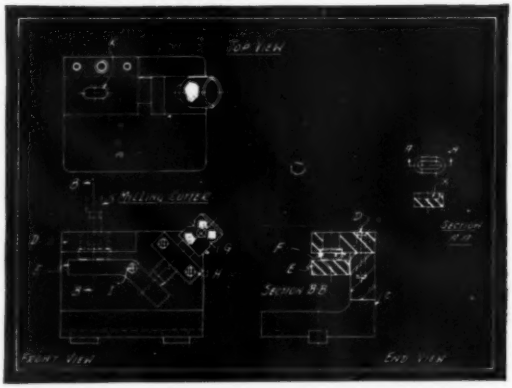
SOUTH SAN PEDRO AT SIXTEENTH STREET • LOS ANGELES 15, CALIFORNIA

PROFILING FIXTURE

To profile depth (A) in the piece shown, the fixture illustrated was designed for high speed production.

An attractive feature of this profiling fixture is that the workpieces are quickly loaded and unloaded, can be held rigidly in place during operation, and there is a special hardened plate to guide end milling cutter instead of the usual tracer pin and profiling guide plate.

Body of fixture is a simple right angled machine steel piece, provided with two milling machine keys for aligning it with machine table.



Front view shows cutter guide (D) which is fastened to body with screws and dowels. Purpose of this plate is to locate piece in recess (F) and to guide end milling cutter of the correct diameter around contour (K), shown in top view. Contour of the plate is made to conform with contour in the piece shown in section A-A. This plate is hardened

Save Money with a Marschke Multi-Speed Floor Stand

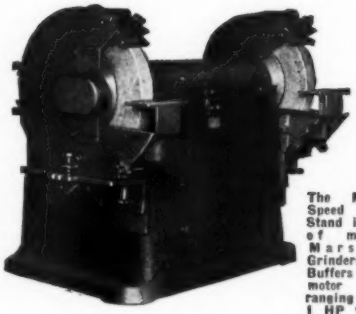
Wheels are the big item of foundry cleaning room costs but *wheel costs can be controlled.* There are two fundamental requirements:

1st. Constant surface speed for all stages of wheel wear.

2nd. Smooth, vibrationless wheel rotation, no matter how heavy the cutting load.

These two requirements, also safe wheel guards with provision for good dust removal are supplied with the Marschke Multi-Speed Floor Stand.

The two 24" x 4" wheels powered with 10 or 15 HP motor—with three speed changes—housed in a massive one-piece, box-type base casting assure *maximum metal removal with minimum wheel wear.*



The Multi-Speed Floor Stand is one of many Marschke Grinders and Buffers with motor sizes ranging from 1 HP to 40 HP.

Let us tell you more about the efficient economy of this machine.

Write to

VONNEGUT MOULDER CORPORATION

1805 MADISON AVENUE ● INDIANAPOLIS 2, INDIANA



Copper Head Laps are Economical to Use. The only Wearing Part is the Replaceable Copper Sleeve.

COPPER HEAD LAPS PAY FOR THEMSELVES IN TIME SAVED

Costly tool room time is saved when you use Boyar-Schultz Copper Head Laps. They are also fast working . . . a double saving. Copper Head Laps never wear out; sleeve adjustment feature permits maintaining correct lapping size till worn out when it is replaced with a new sleeve. Available from Stock in standard sizes, ⅛" to 2½".

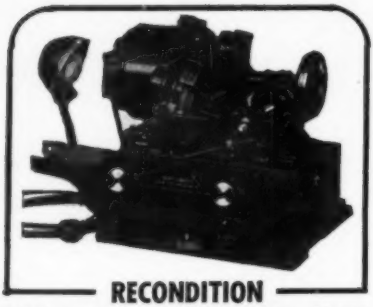


BOYAR-SCHULTZ SMB MACHINE BOLTS SAVE the Machine - SAVE the Job - SAVE Time

Heat treated alloy steels make them TOUGH for heavy work; machined heads and carefully cut threads make them ACCURATE for the most exacting tool room work. Heads are machined square with bodies, presenting a clean, flat surface to the T-Slot. Work is held tightly under heavy machine cuts. Close adjustments are possible.

Avoid worn or poorly made bolts. They can cause costly damage to machine beds, ruining the machine's accuracy. For best results, use SMB Nuts and Washers. They are specially made for use with SMB Bolts.

BOYAR-SCHULTZ CORPORATION
2108 WALNUT STREET **CHICAGO 12, ILLINOIS**



RECONDITION

YOUR SAWS AT VERY LOW COSTS

Howe - Lindsey Automatic Saw Sharpener, the fastest and most compact machine for sharpening hack saws, band saws, or metal slitting saws. Automatic in action, requiring unskilled labor; will produce nearly perfect cutting tooth, provides for greater production and longer life of blades, saving steel.

HOWE AND SON, INC. HINSDALE N. H.

and ground to prevent wear from milling cutter.

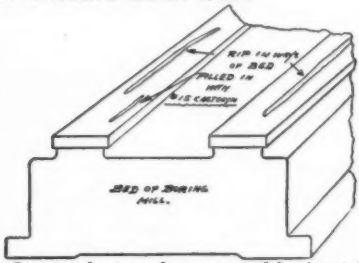
The positive clamping arrangement is made up of a thumb screw (G) which is passed thru block (H). This block is threaded to receive screw (G) and is held in place with two cap screws. The screw is knurled to give a good finger grip and has four holes around its circumference to give operator a method of increasing pressure on link when extra pressure is required.

Link (E) is pivoted on shoulder screw (I) with length of the arms about equal. To obtain good clamping effect, the angle should not be more than 30°.

To load fixture with material, the piece is placed into recess (F) in the locator, as shown in end view section B-B. Thumb screw is then advanced against one arm of link, causing other arm to rise up, thus locking work into position between link (E) and location plate (D). Link (E) should be designed so that when it is in the locked position, it will be parallel with plate (D) otherwise depth of the work to be profiled will not be a true depth.

By Alex S. Arnott

SALVAGING WORN WAYS

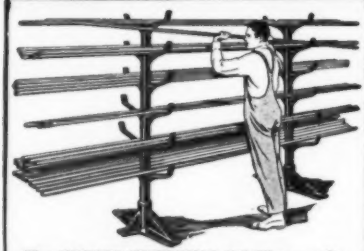


In our plant we have several horizontal boring mills and milling machines which are often put out of service when chips become imbedded between the table and the ways. Machining the ways, inserting a plate and machining over again was too costly and resulted in shutting the machines down for several weeks. We had used EUTECTIC products on other jobs, so we filled the rips with No. 15. First we used a hand-grinder to clean the rip, drilling a few holes for securing the weld. We had excellent results, as it was easy for our scraper to rescrape the ways, and the repair was completed in a very short time. Some of these jobs were done over a year ago, and are still in service.

By ARTHUR W. STADLIN
(Courtesy—The Eutectic Welder)

SAVES TIME

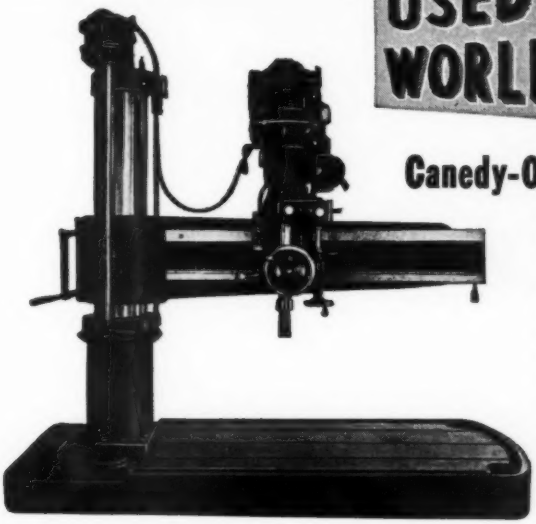
IN YOUR STOCK ROOM



The BROWN SECTIONAL RACK saves the time wasted end-hauling stock from the old-style, closed-side rack and quickens the selection of sizes by greater visibility. Built of standard metal sections: can be expanded for changes in stock or growth of business. Made in 5 styles: can't burn, depreciation practically nil.

SEND FOR BULLETIN 26-B

BROWN ENGINEERING CO.
126 N. THIRD ST. READING, PA.



USED THE WORLD OVER

Canedy-Otto Radial Drill

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line

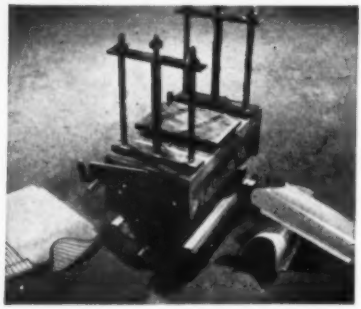
Early delivery possible.

SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3'	4'	5'
Greatest distance from spindle to base	43¾"	48"	46"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10¾"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1180, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	88"	98"	98"
Working Surface of Base	20"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

CANEDY-OTTO MFG. CO.
CHICAGO HEIGHTS, ILLINOIS

MOULDING LAMINATED FORMICA



A new development believed to have many postwar applications in the use of laminated plastic material manufactured by the Formica Insulation Co., has been the product of wartime ingenuity and research.

Cut blanks of laminated Formica go into a forming press. When these pieces of sheet come out, they are formed into ammunition chutes for bombers.

Heretofore, when it was desired to shape Formica, it was necessary to build molds to mold the material to shape.

The engineering department at Formica with cooperation of some aviation engineers employed in the factories making the big bombers, discovered that the cured sheet could be heated up to a temperature just under the blistering point, and if stamped quickly, could be formed to shape.

Continued experiment demonstrated that the formed shape could be maintained.

The press used in the technique has inexpensive dies made of wood or Pregwood, one of the Formica wartime laminated plastic products which is being used for airplane propellors.

Formica engineers disclose that the forming press operation is done quickly and simply.

TAMALOY CUTTING TOOLS

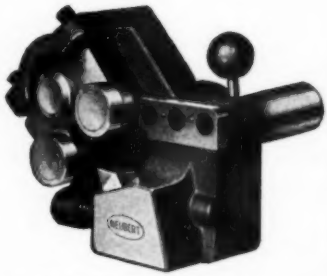
A new 8-page catalog, gives illustrations, diagrams and specifications for Tamaloy carbide tipped cutting tools, tool blanks and lathe and grinding centers.

Arranged for ready reference, the catalog contains brief descriptions of the characteristics of the various grades in

NEUBERT BAR TURNERS

Are the logical answer to your turning problems

★ Will hold accuracy to within .0005".
★ Roller bearing rolls burnish the work to a smooth finish.
★ Retractable tool slide prevents marring the work on withdrawal.
★ Extra rigidity means accuracy and smoothness with heavy cuts and feeds.
★ Fully adjustable for quick set up.
★ Ample chip clearance.



Three sizes.	*Quick delivery.*
⅝" capacity	$ 68.00
1" capacity	85.00
1¾" capacity	110.00

Dealers wanted. Write for circular.

NEUBERT MACHINE COMPANY

Precision Cutting Tools 341 W. Willow, Long Beach 6, Calif.


Precision
CENTER OF CENTERS
is made for the smallest tool room lathes as well as the largest railroad shops. Severe conditions are no hazard to the accuracy and long life of the large taper thrust and annular roller bearings. Precision mounted, front bearing cone seats on resilient pad—a shock absorber protection against tool breakage. Available in taper shank, slip in, slip over and spindle types. For unconditional proof, test in your own plant.
Utility Sleeve
will cut tool costs. A saving of at least 40% (some users report 75%) with this removable taper shank tool driver. It is used with taps, drills, counterbores, reamers, end mills, center drills, countersinks, woodruff cutters, etc. The sleeve is a two jaw collet in action, fitted over the diameter of the shank of tool, which is positively driven by flats or the tang on shank end.
SPECIAL BULLETIN GIVES FULL INFORMATION ON UTILITY TOOLS.
THE J. C. GLENZER COMPANY, INC.
6465 EPWORTH BLVD. - DETROIT, MICH.

FISHER BENDER



Sturdy
•
Durable
•
Handy

This machine will bend up to
½" square or round iron,
2"x½" channel iron,
2¼"x5/16" flat iron cold.

•

Weight 40 Pounds

•

Catalog No. 8 available

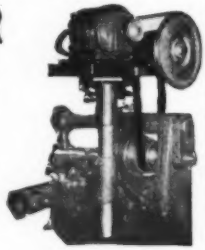
•

T. H. LEWTHWAITE MACHINE CO.
311 East 47th St. New York 17, N. Y.

MODERN...

MOTOR DRIVE

Prompt Shipment



Save floor space, save power, and eliminate line shaft expense by installing MODERN MOTOR DRIVES in your plant. All drives are ball-bearing equipped and designed to fit practically every machine tool. Soundly engineered for long life.

MODERN MOTOR DRIVES DIV.
NICHOLS ENGINEERING CO.
2400 W. MADISON ST., CHICAGO 12, ILL.

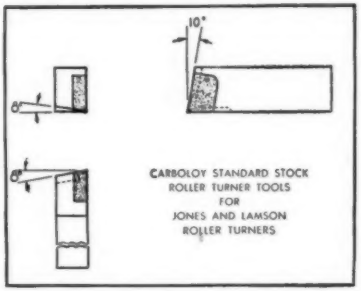
which Tamaloy is supplied, with suggestions as to their appropriate applications.

A group picture of varied special Tamaloy tipped tools, dies and accessories suggests many further uses to be found for this alloy.

Copies of catalog T44 may be obtained from the Tungsten Alloy Mfg., Co., 65 Colden St., Newark 4, N. J.

ROLLER TURNER TOOLS

Addition to its standard stock tool line of a series of Carboloy Cemented Carbide tipped tools designed for Jones & Lamson roller turners has been announced by Carboloy Co., Inc., Detroit 32. These are in addition to tools for Warner & Swasey and Gisholt roller turners previously available from stock.



CARBOLOY STANDARD STOCK ROLLER TURNER TOOLS FOR JONES AND LAMSON ROLLER TURNERS

At the same time, roller turner tools for W & S and Gisholt lathes have been reduced in price as a result of improved design and lower cost volume manufacturing made possible by increasing demand.

The new standardized J & L Roller Turner tools range in size from ⅜x½" shank size to 1x1¼" shank. Tools are regularly furnished with tips of 78B steel cutting grade of Carboloy Cemented Carbide.

The various tools are designed for J & L roller turners Nos. TX536, 537, 805, 813, 865, 873, 875, 876 and 1013.

INCREASING TOOL LIFE

A method of overcoming tool troubles caused by a combination of scale and the work-hardening of stainless steel forgings was evolved recently on a job involving turning and facing operations on supercharger rotor turbines with cemented carbide tipped tools.

When machining this part (see Fig. 1), it was noted that failures on tools oc-

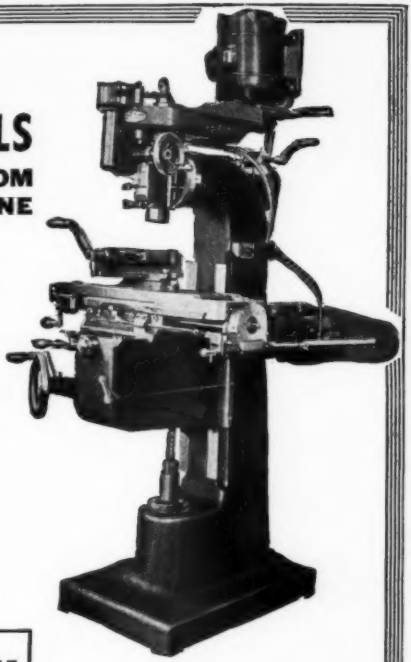
INDEX VERTICAL MILLS

FOR THE TOOL ROOM OR PRODUCTION LINE

Milling, Drilling or Boring. Verniers or Rods and Indicators for locating. Ask the shop that has one. Better still, ask the shop that has an Index and also another of competitive make.

WE are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001", two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8"x16", and troughs for holding rods cross and longitudinal.

This makes it possible for you to obtain, at an astonishingly low price, a precision locator as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and Indicator sets available for other machines also.



Prompt Delivery!

. . . On receipt of order and proper priority certificate.

12" TOOL ROOM ROTARY TABLE

Mfd. by Index Machine & Tool Co.



A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

Write to Factory Sales and Distributing Agents for complete information.

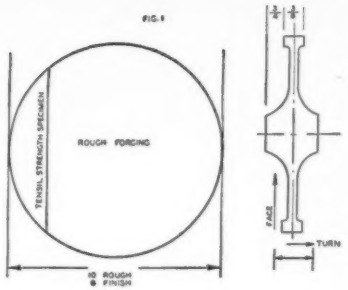
BLANK & BUXTON MACHINERY CO.

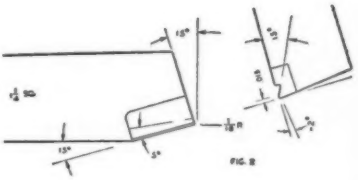
3100 E. MICHIGAN AVE.
JACKSON, MICHIGAN

curred at any point where the tool was cutting a previously machined surface and also at the scale line. The former trouble was found to be due to the fact that stainless steel of the analysis being used, work-hardens rapidly and this increase in hardness penetrates to a depth of several thousandths of an inch. Therefore, a feed **above** 0.008" was maintained, which successfully overcame the trouble previously caused by the carbide tipped tool cutting thru work-hardened stock.

The tool design illustrated in the accompanying sketches (Fig. 2) was worked out to furnish the added strength and chip breaking qualities needed when cutting thru the scale on the stainless steel forgings. A negative strength land on the tool reduces the tendency of the material to tear out the tool's cutting edge.

In addition, a reverse angle breaker of from 4°-5° prevents the chip from curling back and impinging against the cutting edge at approximately the scale line as it otherwise would do on this particular set-up. In this instance, it was found that the best way to put the breaker in is to grind a regular breaker at 15° positive rake at a reverse angle to the cutting edge. After the breaker is in, a land at from -2° to -3° and 0.015" wide





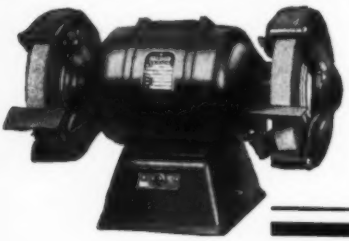
BALDOR
BALL BEARING GRINDERS

— built for long, heavy-duty service

AT RIGHT: Special Carbide Tool Grinder for accurately and quickly sharpening carbide tools; sturdy ½ hp., ball-bearing, reversible motor. 6" Silicon carbide wheels; adjustable tool-rest tables. Complete as shown.....**$95.00**

BELOW: Baldor Grinder No. 7106. Built sturdy for heavy-duty, precision grinding; ½ h.p. single-phase, ball-bearing motor; 3400 r.p.m., 60 cy., 7" Vitrified bond wheels.....**$39.00**

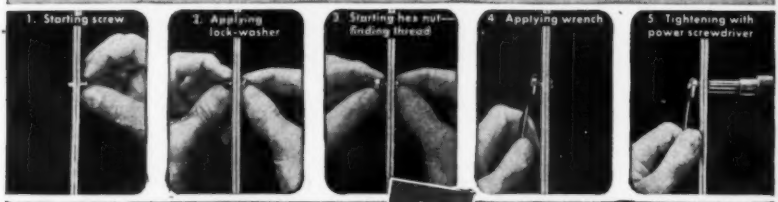




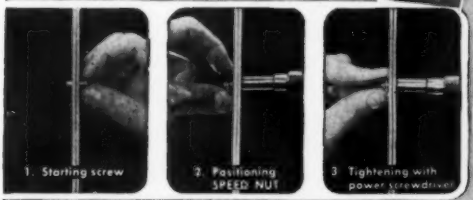
Ask for Bulletins 305-A & 319

BALDOR ELECTRIC COMPANY
4368 Duncan Ave., St. Louis 10, Mo.

Which is Better?



THE OLD WAY WITH 5 HAND OPERATIONS



OR THE SPEED NUT WAY WITH ONLY 3 OPERATIONS



And a SPEED NUT is a self-locking nut, too, that weighs less, stops vibration loosening and cuts assembly costs 40-50% . . .

The SPEED NUT method requires only 3 hand operations as shown in photos above. And only 2 parts are needed instead of 3. Why go through 5 hand operations when only 3 are necessary? Why handle 3 parts when only 2 are required? For an eye opener on the economies of the SPEED NUT system just multiply this 40% motion-saving by the millions of fasteners you use per month. Then add to that the saving by eliminating 1/3 of the parts. Your figures will amaze you. The winning products in postwar competition will be those that are assembled faster and protected against loosening from vibration. Billions of SPEED NUTS were used before the war and on war products, too. More billions will be used on postwar products. Over 2,000 shapes and sizes. Engineers who move up faster are those who know how to make assembly lines move faster. Write for literature.

TINNERMAN PRODUCTS, INC.

2107 FULTON ROAD, CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario

In England: Simmonds Aerocessories, Ltd., London

Speed Nuts* (PATENTED)

*Trademark Reg. U.S. Patent Office

FASTEST THINGS IN FASTENINGS

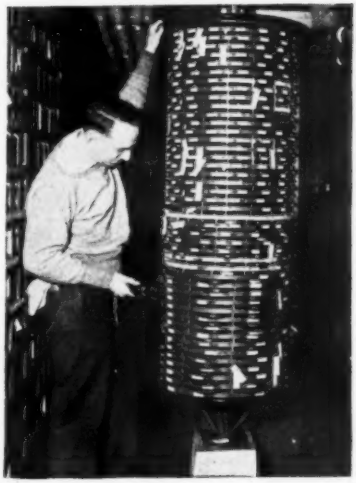
is ground on a 6" diamond pedestal grinder.

With the tool illustrated, an average of 10 pieces were faced and turned between grinds, altho the part had a Brinell hardness of 280-320. Speed was 140-160 sfpm with a depth of cut of 1½".

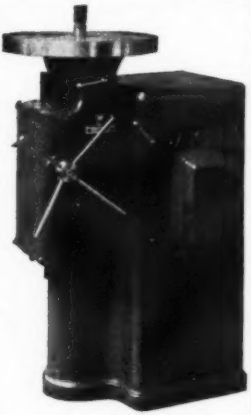
(Courtesy—Carboloy Co., Inc., Detroit.)

TURNTABLE GAGE RACK

This tier of circular wooden shelves mounted on a turntable now provides storage for 400 snap gages at General Electric's Fort Edward plant. Since the gages are issued and returned daily, the problem was to store them in an accessible position using a minimum of floor and wall space. C. S. Loughlin of the plant's Planning Department devised this tier with shelves spaced to accommodate the different thicknesses of the snap gages and with separators between the variously sized gages. The separators also act as spacers for the shelf above. When a gage is removed, a tag is attached to that space in the rack. The entire tier is mounted through the center on an iron pipe which rests on a ball bearing on the bottom and runs thru a roller bearing on top. A pipe rail attached to the top and bottom shelves facilitates turning the rack.



For Contour Grinding



● The Baker Model 3 Contour Grinder provides economical, rapid and accurate grinding and polishing of contours or irregular shapes. Provided with vertical reciprocal movement of spindle—3/16". Diamond dresser is standard equipment and is quickly mounted.

Capacity, diameter of wheels —½" to 4". Capacity, face of wheels—2" - 2½" - 3". Diameter of table—18".

Write for illustrated circular.

BAKER BROTHERS, INC.

Drilling, Boring, and Tapping Machines **TOLEDO, OHIO**



New Book

on Tools for Obtaining Accurate Thread Forms in Less Time

Remarkable savings are being made in thread grinding through the use of the new Tru-Thread Diamond Tools for dressing thread grinding wheels.

Tru-Thread Diamond Tools employ a radically new principle, applied for the first time by Wheel Trueing engineers, and utilize the hard characteristics of a diamond of a shape never before used for such a purpose.

The results of this new development are reported by users who tell us—for example—that with Tru-Thread Tools they are running three to four times as many pieces as they obtained with their previous tools.

Tru-Thread Tools obtain wheel forms quickly and accurately and leave the wheel grain sharp and free-cutting. Wheels cut clean, hold their form longer and grind more pieces between dressings. Wheel cost, tool cost, and cost per piece all are reduced accordingly.

These tools, which are made in types for dressing each specific form, are completely described and illustrated in a new booklet which we will be glad to send you on request. If you have thread grinding equipment, this booklet will point the way to substantial savings. Send for your copy.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada

SHOT PEENING FOR LONGER FATIGUE LIFE

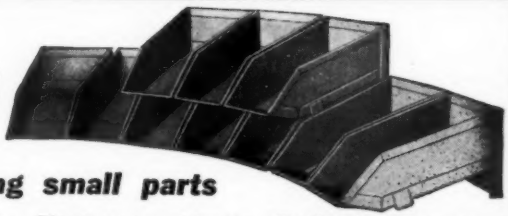


To increase the life of stressed parts such as gears, springs, axles, torsion bars, crankshafts, connecting rods, milling cutters, pneumatic drills, etc. by shot peening, a line of machines known as Wheelapeening equipment has been announced by American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind.

In the Wheelapeening machines, a rain of metallic shot is directed against the part at high velocity. Each shot striking the surface makes a tiny dent or pit, so that the cumulative effect is to stretch the surface layers by cold working, to put them in a state of residual compression. And since failure occurs under tension stresses, never under compression stresses, fatigue cracks do not get a chance to start.

With the Wheelapeening machine illustrated, torsion bars (which take the place of conventional springs in tanks, buses, and trucks) are placed on skewed-dished rollers which convey the bars thru the machine and impart a rotary motion so that all surfaces of the bar are exposed to peening action. Inside the machine, a Wheelabrator (airless, centrifugal blast unit) hurls a rain of shot at high velocity onto the surfaces of the torsion bar. Other models of Wheelapeening machines are available to give different combinations of motion for peening parts of various shapes and sizes.

NEW BINS



for assembling small parts

Floors slope to feed parts to front — end reaching and fumbling.

Bins taper toward front to form convenient semi-circle —keep all bins within easy reach.

Nesting, locking construction for rigid set-ups, easily changed when necessary.

All-welded construction. Rolled, smooth edges.

Two sizes—tapered or straight edges. Hoppers available for steady work.

Write Stackbin Corporation, 55 Troy St., Providence, R. I., for further details and low prices.

STACKBIN SYSTEM

"Stacked and Still Accessible"

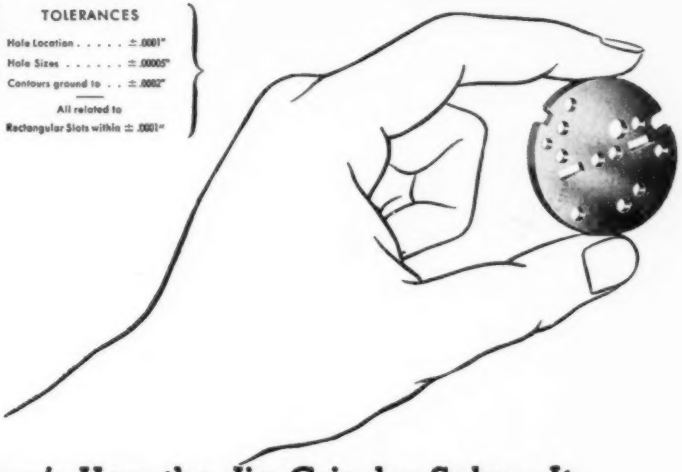
STACKBIN CORP., Providence, R. I.

A Tough Hole-Grinding Job?

TOLERANCES

Hole Location . . . . . ± .0001"
Hole Sizes . . . . . ± .00005"
Contours ground to . . ± .0002"

All related to
Rectangular Slots within ± .0001"



Here's How the Jig Grinder Solves It

It's anybody's guess how long this intricate hole-grinding job would normally take, using the tedious toolmaker's buttons and locating-plug methods...especially to such tolerances. But it's no problem for the Moore Jig Grinder.

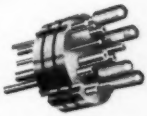
This unique machine precisely relocates holes and finish-grinds them within .0001". And then it checks its own work.

The master gage illustrated is one of many identical gages, each used by different manufacturers to determine the final production accuracy of a war-vital ordnance part. With the strictest interchangeability of parts called for—the burden of proof remains the gage's job. And, in turn, the accuracy of the gages depends on precision hole-grinding and finishing.

Toolmakers who measure their craftsmanship in strict tolerances find the Moore Jig Grinder the answer on all counts. You will, too.

The Moore Jig Grinder has the capacity to grind holes from .030" to 4", provides .00005" per inch accuracy of lead screws and grinding speeds of 14,000 and 50,000 RPM.

May we send you a detailed bulletin on its application and ease of operation? There is no obligation, of course.



Proof of accuracy: Three individually ground master gages plugged together.

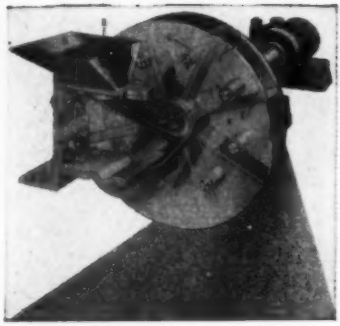
MOORE SPECIAL TOOL CO., INC.
728 UNION AVE., BRIDGEPORT 7, CONN.



P.S. All the holes in the gages illustrated were bored on the Moore Jig Borer. With its built-in system of coordinate hole location the Moore Jig Borer enables the operator to spot, drill, bore and ream all holes in a work piece with minimum tool changes. And its accuracy is held within .00025" in any position of the table. Investigate its advantages in your applications.

Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND



The Wheelabrator, as illustrated, is a mechanical unit that utilizes controlled centrifugal force instead of compressed air for throwing shot upon the work. It is completely airless, therefore it eliminates costly compressed air generating equipment. Shot is fed to center of the bladed wheel from an overhead storage hopper whereupon it is hurled by centrifugal force, under perfect control, upon work to be peened. An impeller (G) rotates with the wheel proper and carries shot to an opening in the stationary control cage (F) where it discharges to the bladed section of the wheel. At this point the shot is picked up by the inner ends of the throwing blades (E) and is gradually accelerated in its passage to the periphery of the wheel. The final throwing velocity is the result of radial and tangential forces. Change in direction of the blast stream is obtained by turning control cage which changes position of the opening.

Provision is made in Wheelapeening equipment for continuous reuse of shot, for the removal of broken shot and dust, and for the addition of new shot to the cycling system. The Wheelapeening method of shot peening is said to permit processing at much higher speeds, to reduce power requirements by 80%, and to save production costs.

EXTENDING TOOL LIFE

Tools and gages like all other manufacturing equipment and supplies, wear out and break. But a broken tool or gage is a very serious matter because of its cost and, today, the time required for replacement. Fortunately, many broken or worn-out tools and gages can be re-



SPEED punching and SAVE belting with MASTERDRIVE

How it speeds — High torque, high slip motors pick up the load with minimum shock. No slipping. Gear head motor reduces output shaft speed, permitting a large motor pulley and a high percentage of belt wrap.

How it saves — Use your present belting. Save rubber, and expense and delay of grooving pulleys. Belt failure will not capsize drive.

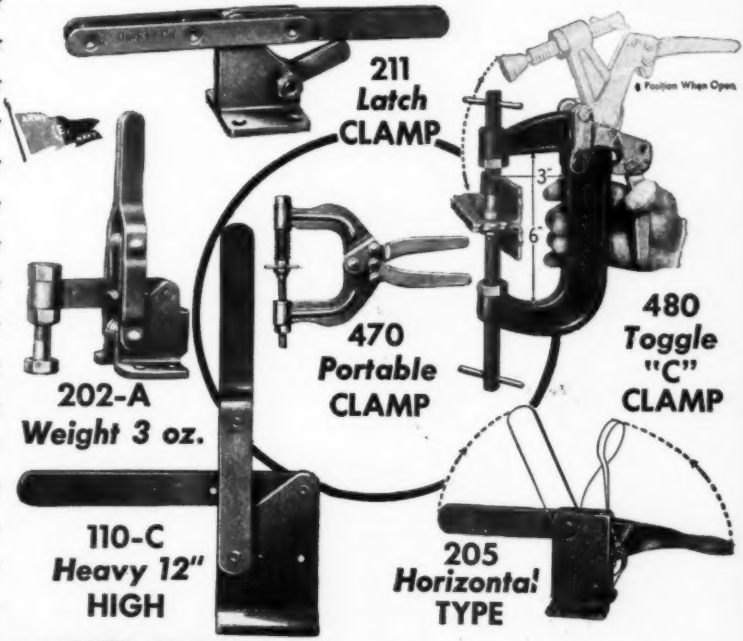
● Drive easily mounted above or behind press. No interference with roll feed. Does not obstruct die removal through back of press. A single complete installation with Master Gear Head Motor — one responsibility. Write for details today!

THE MASTER ELECTRIC CO.
INDUSTRIAL EQUIPMENT DIVISION • DAYTON, OHIO



Building JIGS or FIXTURES?

Then you'll need some of those quick acting, positive holding, De-Sta-Co Toggle Clamps . . . Bulletin No. 43 illustrates and details many types . . . complete range of sizes, and will help you in the selection of clamps best suited to your job. Send for it.



DETROIT STAMPING CO.

Established Over 25 Years

347 Midland Ave • Detroit 3, Mich.

conditioned and restored to full usefulness and extended life in service.

It has been found from long experience that one of the simplest, least expensive and most satisfactory methods of repairing broken and worn-out tools is by brazing. An unusually effective brazing medium in use at present is the low-temperature silver brazing alloy. This alloy has a working temperature of 1175° F., permitting a short heating time and consequently causing a minimum of distortion and reduction in hardness of the tool. The alloy is free flowing, and capillary action carries it into every part of a joint area. Minimum joint clearances are the best; the thinner the film, the stronger the joint.

The broken tool is set in a fixture devised to suit the job. Cleaning may be done mechanically by abrasives or chemically, with carbon tetrachloride, for example. Proper fluxing keeps the brazed area clean, dissolves oxides, reduces surface tension of silver brazing alloy and makes it free flowing so that it may penetrate to all parts of the joint. The silver brazing alloy may be applied by hand feeding the alloyed wire, by preplacing sheet or strip of the alloy between parts to be brazed or by pre-tinning joint surfaces with the silver alloy.

The heating may be done with the oxyacetylene gas torch, in a muffle furnace, dipping in a molten salt bath or in the induction furnace.

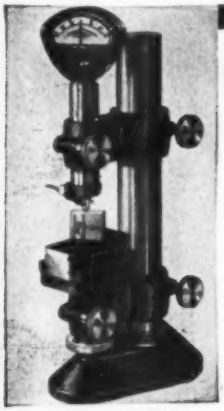
By these methods all types of tools may be repaired including band saws, drills, taps, broaches, milling cutters, forming tools, metal slitting saws, gages, reamers, shanks and tangs of drills and adapters, etc.

An interesting article on the design, maintenance and repair of tools and gages has been written by Frederick L. Woodcock, Chief Engineer, Hamilton Standard Propellers Div., United Aircraft, E. Hartford, Conn.

Copies may be obtained on request from Handy & Harman, 82 Fulton Street, New York (7) N. Y.

IMPROVISED STAMP

This improvised stamping device, planned by W. N. Chatrow, a tool designer, is made from a scrapped fixture previously used for positioning work on a jig borer. It is used effectively to stamp identification information on switch shells at General Electric's Schenectady Works. The scrapped fixture consisted of a handwheel which rotated a shaft by means



MIKROKATOR "MIKRO" (MINUTE)
FRICTIONLESS AMPLIFICATION

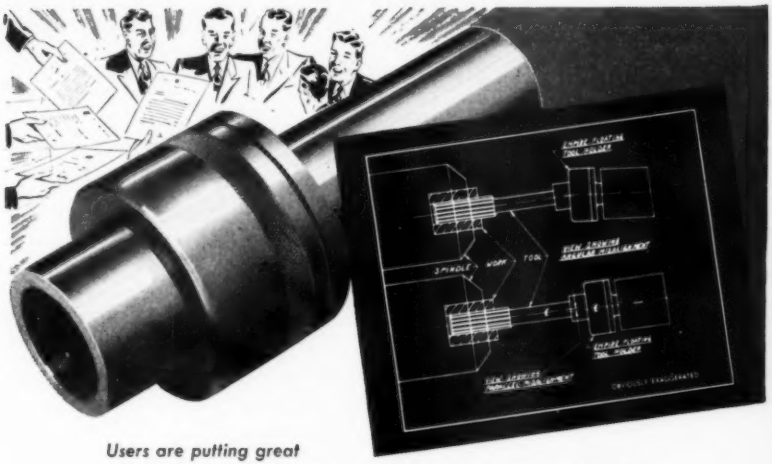
RAPID
RELIABLE
SENSITIVE
LIGHT
COMPACT
STURDY

Complete elimination of friction, lag, and backlash insures positive, dependable repeat readings. Pointer responds instantly to the slightest movement of measuring tip; no swinging past true reading, no waiting for pointer to come to rest. No lights or electro magnets, no warm-up period required. No electrical connections, can be readily moved to different locations. GRADUATED: .0001" to .00001"; .001 mm to .0002 mm.

Made in 4 SIZES

Write for CIRCULAR — BB

SWEDISH GAGE CO., OF AMERICA
8900 ALPINE AVE., DETROIT 4, MICH.



Users are putting great emphasis on the statement that the Empire Floating Tool Holder is

The First Floating Tool Holder that Compensates for BOTH Parallel and Angular Misalignment

in letters and by word of mouth users are expressing their genuine pleasure with the performance of this new Empire Floating Tool Holder. They say it is the only one that really floats, and corrects angular and out-of-parallel misalignment. No bell mouths can occur. Holes can be reamed to close tolerances — starting with the very first one you ream. Having only five parts — easily disassembled — the holder has a reduced wear factor. By referring to diagram you will note that the cap and shank float independently of each other, achieving a free and easy movement — a unique engineering design not present in any other floating tool.

Available with holes and sleeves in following sizes: ⅜", ½", ⅝", ¾", 1", 1¼", 1½" with shank diameters: ⅝", ¾", 1", 1¼", 1½", 1¾", 2", 2¼". These Holders are available for any machines from the smallest Brown & Sharpe Automatics to the largest hand or automatic screw machines.

Try an Empire Floating Tool Holder for 30 days.

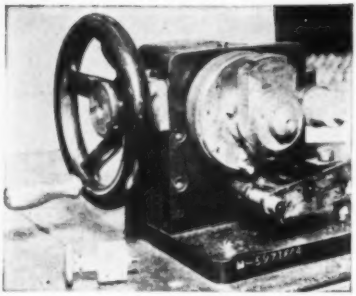
If you're not thoroughly satisfied, return it for full credit.

SEND FOR CATALOG **BUY WAR BONDS**

The Blades That Reduce Friction

EMPIRE Tool Co.

8782 Grinnell Ave.
Detroit 13, Mich.



of bevel gears. It was stripped of unwanted parts and a friction drive wheel was added to revolve a spring arbor for holding the shell and rotating an ink roller. In operation, strength of the impression is controlled by a screw which moves the spring arbor in relation to the rotor. Location of the stamping in alignment with end of the shell is controlled by moving rotor forward or backward along shaft. A pointer locates shell in the proper position for stamping. A ratchet stop makes it impossible for the handwheel to revolve in the wrong direction.

TARNISH PREVENTION

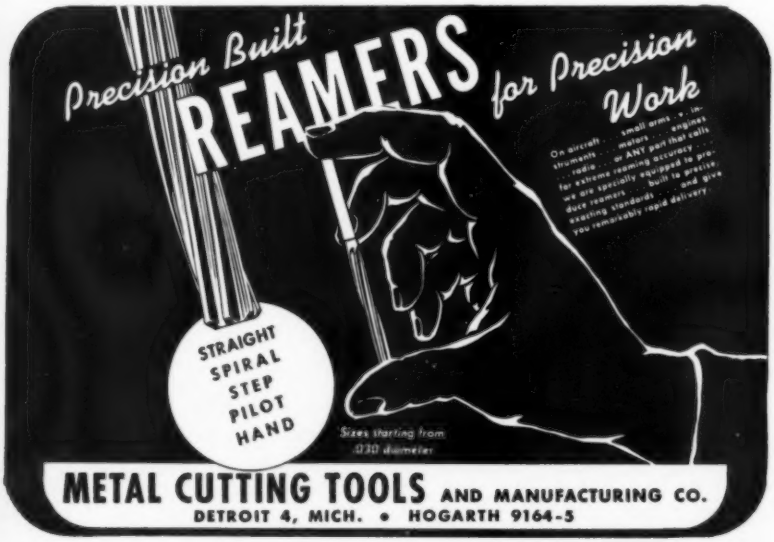
There are several ways to prevent tarnishing of metals that are to be heat-treated. One of the easiest methods is to use welding flux.

An effective tarnish preventative is reported to be a coating of Autochemic Eutector Flux, the chemical compound especially developed for use with Eutectic "Low Temperature" Welding Rods. When used for this purpose, the flux is slightly diluted with water and poured into a tank large enough to contain the part to be coated. The mixture is agitated to keep the heavier elements from settling and the entire part is then submerged in it.

Another effective way to prevent tarnish is to coat the part by immersing it in flux that has been melted in a crucible or furnace.

An actual application of the use of welding flux as a tarnish-preventive was recently reported by the maintenance foreman of a large midwest manufacturing company.

His department makes small tool steel reamers, used to ream seats on welding





Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

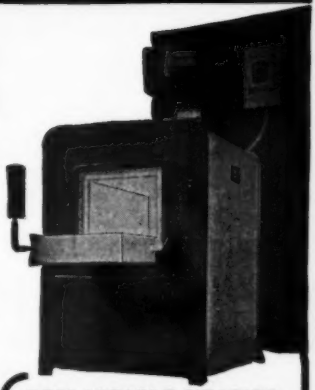
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8"W 6"H 14"L	29.6	3400	14.8	$124.00*
MH-4	10"W 6"H 18"L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.

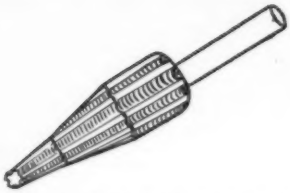


REPLACEABLE HEATING ELEMENTS—Replaceable nickel chromium resistors embedded in rectangular refactory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.



COOLEY ELECTRIC MANUFACTURING CORP.
36 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.



torch fittings. With the tool, shown, hundreds of worn welding torch parts are salvaged.

The reamer has a double taper that is turned as close as possible in a lathe, spotted and filed to a close fit in the female fitting and then the clearance later is filed in by hand. During the subsequent hardening process, scale accumulated on the tools. To overcome this, the entire surface of the tool was coated with a paste made of Autochemic Eutector Flux 16. The tool is then heated to the desired temperature, and immediately quenched in water. This procedure keeps the surface of the tool as bright and clean as before heat-treatment by preventing any oxidation.

NEW LOW COST
DRILL GRINDER

Anyone can do expert drill grinding with this simple-to-use drill grinding attachment—fits on any bench grinder—saves buying new twist drills—saves time and materials that dull bits waste. Grinds bits from 3/16 to 1¼. Write for FREE literature.



T & H MFG. CO.
811 E. 31 St.
Kansas City, Mo.

WHEEL DRESSING FACTS

Presenting special "how to" information never before published, "Inside Facts About Dressing," an instructive booklet on angle-tangent-to-radius dressing and related shop problems, has been published.

This new 16-page booklet, just off the press, is written and illustrated to help the man at the machine. It explains in simple terms, and in an entertaining manner, how to avoid chatter, how to eliminate wheel marks, how to prevent diamond wear, how to check accuracy without making templates, how to prevent "overshooting" of radii, etc.

The booklet covers all phases of plain radius dressing, plain angle dressing and angle-tangent-to-radius dressing. By furnishing specific "do's and don'ts" it helps the operator avoid common troubles and gain greater accuracy in his work, regardless of whether or not he is using a Perfex Dresser.

In all, the booklet gives 47 practical tips on how to solve difficult dressing problems, in addition to suggesting new and better ways to short-cut operations and save time.

It will be sent gratis, in any quantity desired, to any plant requesting copies. Write Perfex Dresser Corp., 3608 Gaylord Ave., Detroit 21, Mich.

An Automatic Acetate Shield For Welders' Helmets



Sturdily constructed, precision made, and completely automatic in operation! Shield instantly protects eyes when helmet is raised—and swings into "up" position, as shown in X-Ray view above, the moment helmet is lowered. Fits all Sellstrom helmets.

Sellstrom Manufacturing Co.
646-10 N. Aberdeen St. Chicago 22, Ill.

Cut Clamping Time 50%—OR MORE!



Cardinal SPEED VISE
Opens and closes full range instantly. Locks and unlocks with half-turn

Cardinal Automatic AIR VISE
Synchronizes vise opening and closing with machine tool cycle—completely automatic.

WRITE FOR BULLETIN B

CARDINAL MACHINE COMPANY
GLENDALE CALIFORNIA

Consult

SYNCRO

the HOME of Precision and Production

SYNCRO specializes in the manufacture of precision machined products and in the solution of unusual engineering and production problems. The skill and experience of SYNCRO craftsmen is at your service — now and after Victory.

SYNCRO DEVICES, INC.

Ferndale 20, Michigan



TOO TOUGH FOR ORDINARY WHEELS

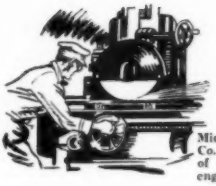
MID-WEST Super-Cut TAKES IT IN STRIDE



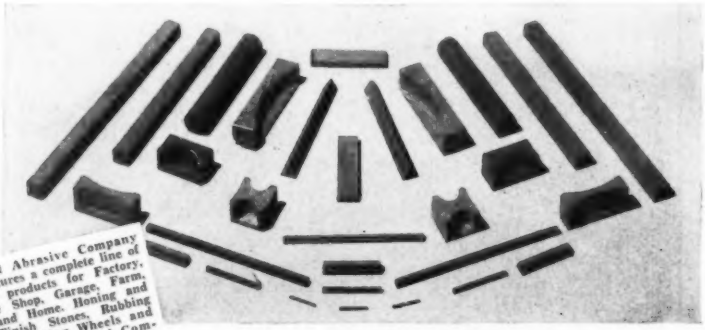
MID-WEST Super-Cut grinding wheels are unusually cool cutting—virtually eliminating all hazards of over-heating costly and irreplaceable tools.

Mid-West Super-Cut wheels are made with our No. 2 grain (special aluminum oxide) which provides the necessary ruggedness for dependable performance and longer life.

Super-Cut wheels cut remarkably fast, and this advantage when combined with the well known Mid-West quality and careful workmanship insures the utmost in efficiency and economy.



Mid-West Abrasive Co. maintains a staff of experienced field engineers.



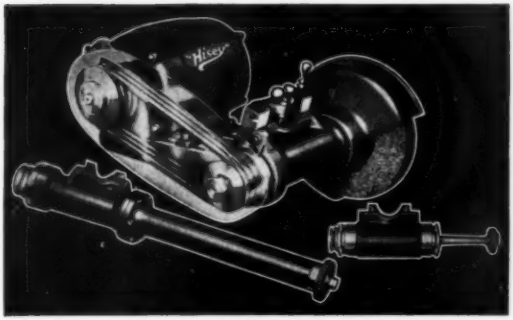
Mid-West Abrasive Company manufactures a complete line of abrasive products for Factory, Machine Shop, Garage, Farm, Office and Home. Honing and Super-Finish Stones, Rubbing Bricks, Grinding Wheels and Sand Papers—Special Compounds and many other Abrasive Specialties. Jobbers and Factory Representatives located throughout the United States.

DETROIT 11, MICH.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE



HISEY 3 H. P. Grinder set up for external grinding. The Internal grinding heads are interchangeable with the external head on machine.



You CAN Grind It!!

The War Program has presented many manufacturers with grinding problems. No matter how well equipped a grinding department may be, a job will turn up which cannot be handled with the regular equipment. This is where HISEY Wide Range Precision Grinders step into the picture. Mounted on lathes, boring mills, planers, etc., they will do any internal, external or surface grinding operation. They are built for tool room accuracy with ruggedness and power for continuous production work. Size range from ¼ to 10 H.P. capacity in a number of different models.

WRITE FOR CATALOG No. 70L-H

Hisey THE HISEY-WOLF MACHINE CO. CINCINNATI, OHIO.

"SET UP" Your Machinery ANYWHERE..



. . . with Empco JACKS

TIME can be saved—and space too—because with these new self-aligning EMPCO Jacks you can set up your machinery anywhere without first locating a level spot. Periodical re-leveling time is saved too, because Empco Jacks' quick two-way adjustment feature gives accurate results in a few moments. The Jacks have only 3 working parts: upper and lower castings and adjusting screw. The fitted castings permit sufficient "float" for self alignment. If you want to eliminate guess work in setting up your machinery it will pay you to write for all the facts about *Empco* Jacks today!

SIZES

	Normal Height	Width	Normal Length
No. 1 (small) . .	2"	2¼"	4 1/32"
No. 2 (medium .	2 5/8"	3"	6 1/32"
No. 3 (large) . .	3 1/32"	4"	8 1/16"

DELIVERY

Prompt deliveries are made from stock, so wire your order today!

EMPCO

THE ENTERPRISE MACHINE PARTS CORPORATION

2729 JEROME AVE. DETROIT, MICH.

SPEED UP RECONVERSION

with

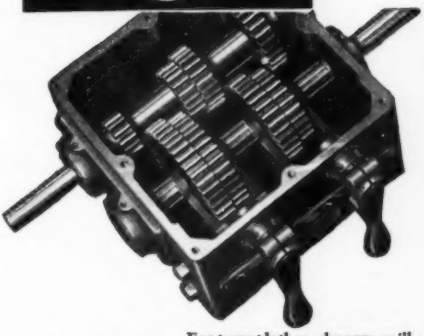
TURNER UNI-DRIVE
Motorizes Machine Tools

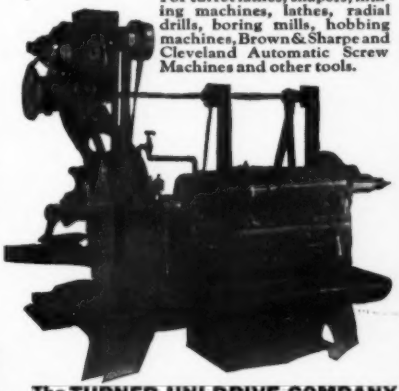
1 **No belts to shift. Drives to large step of cone at all speeds.**

2 **Eliminates overhead line and counter shafts.**

3 **All advantages of geared head, with belt drive smoothness.**

Reconversion will call for speed and more speed. Be ready with TURNER UNI-DRIVE. Now helping to bring schedules through on time in hundreds of plants. Cuts costs. Saves time. Eases operators' work. Increases production capacity up to 25% — 100% — 300%. Each unit operates independently of all others—high and low speeds at will. See your dealer or write us.





For turret lathes, shapers, milling machines, lathes, radial drills, boring mills, hobbing machines, Brown & Sharpe and Cleveland Automatic Screw Machines and other tools.

OUTSTANDING PERFORMANCE FOR THESE TYPICAL USERS

Aircraft Accessories Corp.
American Brake Shoe & F. Co.
Kellogg Division
Southern Wheel Div.
Augusta Arsenal
Bendix Aviation Corp.
Brown-Lipe-Chapin Div. General Motors
Cessna Aircraft Corp.
Chicago, Rock Island & Pacific R. R. Co.
Chicago Screw Co.
Delco-Remy Co.
Div. General Motors
Doehler Die Casting Co.
Electric Auto-Lite Co.
Frankfort Arsenal
Frisco Lines
Holtzer-Cabot Elect. Co.
Imperial Brass Mfg. Co.
International Projector Company
Kohler Corporation
Monsanto Chemical Co.
The New York Air Brake Company
Ohio Pattern & Foundry Company
Republic Steel Corp.

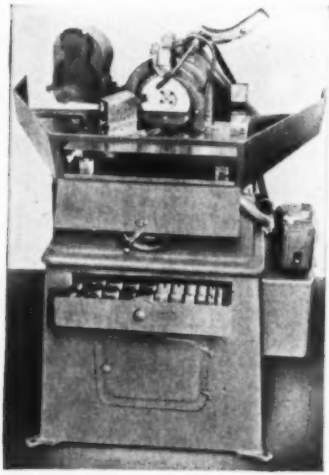
NOW AT WORK FOR VICTORY ★★★

The TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace St. Kansas City 8, Mo.

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

WHAT'S NEW IN METALWORKING

NORTON BURA-WAY GRINDER



CONVINCED that war-time shortages have forced onto industry as a whole, beneficial practices in conservation of tools, and firm in the belief that these practices will be continued in peace-time, Norton Co., Worcester, Mass., has acquired the Bura-way Grinder as a further extension of its comprehensive line of tool room grinders and production cylindrical and surface grinders, flat and cylindrical lappers.

This machine, which will in the future be manufactured and sold under the name "Norton Bura-way," brings to industry the growing concept that metal cutting tools should have "constant relief in the direction of feed". It is claimed the Bura-way provides a means of forming such relief quickly and easily, duplication being within the capacity of the greenest apprentice. Added factors which will contribute to longer tool life, estimated to be up to many hundred per cent, include means of precise control in grinding tool angles, close control of amount of metal removed in renewing cutting edges, precise reproduction of form tools within close dimensional limits, and production of a fine surface finish at the tool's edge to give increased production per grind and a clean cut in operation. Relief angles are controllable within minutes of arc. The unit, now equipped for wet grinding, is equally suited to rough or finish grinding of tools, handling high speed and cast-chromium cobalt steels as well as carbide tipped tools.



It is emphasized that this Grinder will allow tool rooms to establish new standards of accuracy, achieving new and important economies in tool maintenance. It will assist in centralizing tool crib control and will place once again in the

SHELDON



In the Marine Tradition!

Machines and machine tools as well as men must measure up to Marine Corps standards before acceptance . . . must be capable of handling whatever situation arises. That is why we are proud that SHELDON LATHES were selected for the Marine Trailerized Machine Shops as well as for the Army's "Mobile Machine Shop and Mobilized Instrument Repair Shop Units, and as the maintenance lathes for many Navy craft.

Modern battle equipment requires precision machinery. Operation under battle conditions requires rugged, reliable and dependably accurate machine tools. In SHELDON Precision Lathes all of these requirements are fulfilled.

SHELDON MACHINE CO., INC.

4242 N. Knox Ave.
Chicago 41, U.S.A.

WRITE FOR CATALOG



HAVE AN ACE
UP YOUR SLEEVE FOR POST-WAR

How about that post-war product you have been rolling around in your mind? Let Ace help you plan its construction and production. Ace has a complete service offering many real advantages to anyone considering products that involve small parts and assemblies requiring stamping, machining, heat-treating, or grinding.

Here under one roof are the ingenuity and modern equipment to help you design that product of yours . . . make the necessary tools and dies . . . and put it into production. Furthermore, on certain products, we have a complete sales and merchandising staff to put it on the market.

Have an Ace up your sleeve. Plan with Ace now.

ACE
TRADE MARK

ACE MANUFACTURING CORPORATION
for Precision Parts

1251 E. ERIE AVE., PHILADELPHIA 24, PA.

hands of expert tool supervisors and production engineers, the determination of critical tool relief angles, too frequently left to the judgement and even whimsies of the individual shop hand.

NICHOLS MILLERS

A new 12-page picture catalogue illustrating the design and uses of Nichols Millers is offered by W. H. Nichols & Sons, Waltham, Mass. It is called "The Miller that Uses Its Head", and departs from traditional catalogue format by telling the story of the miller as a picture magazine would do it.

The catalogue illustrates how this hand miller performs its fundamental function of bringing the cutter on a sliding head down to the work and also does the work of precision boring machines, lathes and grinders.



Profusely illustrated and described are other processes on the miller, including contour milling, profile straddle milling, heavy hand milling, and vertical milling.

Construction highlights added to the miller since Nichols took over its development 10 years ago are described and pictured in detail. An important feature of the catalogue is the manner in which the miller "uses its head," with the counter-balanced sliding head bringing the spindle to the work by manually controlled rise-and-fall motion. Lever, Rack and Pinion transverse feed, which gives the Nichols Miller flexibility of a lathe carriage is also illustrated.

A section describes the mass-precision methods employed at the Nichols plant, where the rayon pump, called "the most accurate assembly of commercial parts ever produced", is being manufactured as well as the nylon metering pump and the Gerotor.

PRODUCTION MEN:

COULD YOU PIERCE 100 HOLES THROUGH A TEMPLATE IN 10.25 MINUTES?

The ACTUAL TIME STUDY RECORD as reported by FEDERAL TELEPHONE & RADIO CORPORATION



Photos Courtesy Federal Telephone & Radio Corp.

Wiedemann Turret Punch Presses are doing yeoman work at Federal Telephone and Radio Corporation, and hundreds of other companies where short run piercing of sheets and plates must be done at practically long-run low cost and with consistent high accuracy.

The Type R-44 Turret Punch Press illustrated is especially designed for piercing through templates — and incorporates speed of location and piercing, with a unique safety device which makes it impossible for the operator to damage the template. A companion machine, the Type R-43 Micro-Turret Punch Press, produces the templates . . . each hole accurate to ± .002".

You too can by-pass the high cost of short run piercing by putting Wiedemanns in your production line . . . for piercing holes up to 3" in ½" stock . . . 8 to 80 tons capacity . . . 8 to 24 punches and dies at your fingertips with a choice of labor-saving gauge tables.

MAKE THE COMPARISON! The significant time and labor-saving facts about Wiedemann Turret Punch Presses are detailed in Bulletin 92, "The Story of Short Run Piercing Economy." A copy will be sent by return mail. Savings up to 2000% have been reported by users!

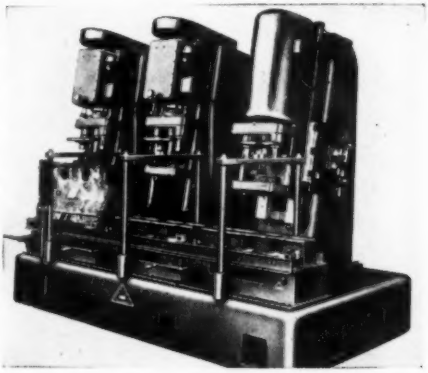
WIEDEMANN MACHINE COMPANY

1831 SEDGLEY AVENUE, PHILADELPHIA 32, PA.

WIEDEMANN TURRET PUNCH PRESSES & GAUGE TABLES

DRILLING CYLINDER BLOCKS

Holes in huge truck cylinder blocks can now be rough drilled thru the solid casting, then semi-finished and finish-reamed, all in one cycle, with a large three-station machine developed by LeMaire Tool & Mfg. Co., Dearborn, Mich.



By being conveyor indexed, the machine provides a progressive setup that eliminates much handling of heavy parts from one machine to another.

The first station is used to drill four holes thru the solid surface of the casting. One of the holes is also counterbored and spot faced to 2⅜" diameter. The second station, equipped with a four-spindle head, semi-finish reams the holes. The third station finish-reams two 1¼" holes and two 2" holes within an accuracy of .001.

The drill heads in the first two stations are driven by standard No. 5000 Twin Ram Hydraulic Power Units mounted at a 10° angle on the face of the columns.

The third station has a sliding type unit that slides on machined ways 63" long, 4" wide, spaced 16" apart.

All four holes are completed in one casting every time the machine cycles. The user states that his production has tripled.

PALMGREN
ANGLE VISES

DRILLING
MILLING
GRINDING
FILING
FITTING
MARKING

Solve Difficult Angle Jobs



★ For Tool Room — Production Line — Bench.
★ Speed up work — End Makeshift Methods.
★ Quick Accurate Setups at any angle.
★ Sturdy Longlife Construction.
★ All Parts Accurately Machined.
★ Jaws Hardened Steel —
★ Plain or Grooved.
★ Made in Sizes from 1½" to 8" Jaws.


MILLING


GRINDING

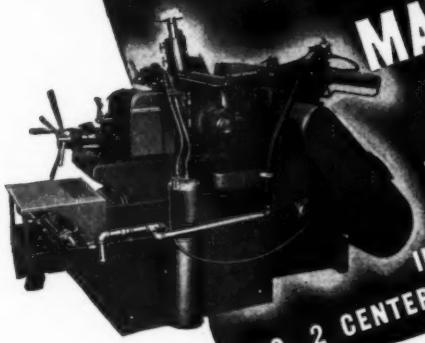

DRILLING

Write for circular 0-10 "101 Angle Operations" and complete line of PALMGREN Vises.



CHICAGO TOOL & ENGINEERING CO.
Mfrs. of PALMGREN PRODUCTS for over 25 years
8384 South Chicago Ave., Chicago 17, Ill.

MODERN COOLANT EQUIPMENT FOR MODERN MACHINE TOOLS



I-12V COOLANT TANK AND FILTER... INSTALLED ON CINCINNATI NO. 2 CENTERLESS GRINDER . . . .

VISIT OUR EXHIBIT
BOOTH A-636
NATIONAL METAL CONGRESS

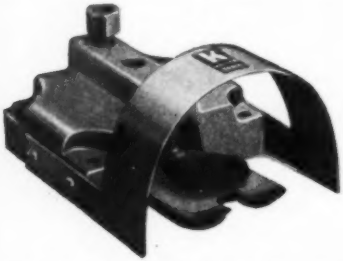
● Hoffman coolant filtering equipment, such as the I-12V illustrated, provides continuously clean coolant with convenient removal of waste. Hoffman models are available in many styles and sizes, with or without temperature control, either for individual machine tools or for serving complete departments. They effect important savings in operating costs and improvements in quality.

WRITE OR WIRE for a skilled representative to discuss coolant handling on your new or proposed equipment.

U. S. HOFFMAN MACHINERY CORPORATION
215 Lamson St., Syracuse, N. Y.
COOLANT FILTERS • FILTRATION ENGINEERING SERVICE

THREE-WAY FOOT VALVE

A new compressed air foot valve to be used with air tools, air cylinders, air chucks, flash welders, forging machines, die casting machines, riveting machines, air vises, and all other air operated equipment is announced by the Keller Tool Co., Grand Haven, Mich.



On tools, where it is desirable for operators to have both hands free, it greatly facilitates rapid handling of work. Safety of the operator is accomplished by the kick guard which prevents accidental operation.

Foot valve is furnished in locking and non-locking types. On the locking type pedal is held in the open position. A touch of the operator's toe releases lock.

A simple adjustment of lever-locking device prevents engagement of operating pedal and changes locking to non-locking type.

Valve mechanism is simple. Normally, valve is closed with outlet side open to the exhaust. When pedal is depressed, the exhaust closes and line pressure is admitted to the device to be operated. Upon release of pedal, air supply stops and outlet to the exhaust is again opened.

Rugged construction features include:—Heavy cast iron body; neoprene valve seat; heat treated and precision ground valve operating stem; heavy gauge steel kick guard; brass screen air strainer. Net weight: 12½ lbs.

SPEEDAIRE REDUCTION UNIT

Newly announced by Cleveland Worm & Gear Co., Cleveland, Ohio, is the Speedaire Worm Gear Reduction Unit, incorporating a fan cooling system which permits a pronounced reduction in size of unit required for a given hp output. Basis of the cooling system is a new type of double wall construction. This provides an air passage completely enveloping oil

New Britain

UNIVERSAL VISE

THE ORIGINAL

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.

NEW BRITAIN, CONN., U. S. A.

WAR or POST-WAR

Production Capacity

We are now in position to take on some additional work. Our plant is ultra-modern with finest equipment. Our staff has had more than 34 years of experience in management, engineering, designing and production — skilled in handling war contracts for large firms—quickly and efficiently.

SEND BLUEPRINTS FOR QUOTATION

Use Our Complete and Modern DESIGNING, ENGINEERING, DRAFTING and INSPECTION Service and Equipment

DEFIANCE METAL PRODUCTS COMPANY

Contract Die and Tool Work
Commercial Stampings

Zachrich Bldg., Defiance, Ohio

Telephone 170



FUNCTIONAL Built to perform under conditions of almost insurmountable difficulties . . . but the jeep comes through! So do Conway Clutches, built to deliver power where you want it!

CONWAY CLUTCHES

Stamina . . . power . . . no maintenance requirements . . . utter dependability . . . these are but a few features which have established these clutches as America's leaders.

Other features: instant starting and stopping . . . drag-free idling . . . large lever ratio . . . ease of engagement . . . centripetal action . . . full length bearings . . . no exposed actuating parts . . . sturdy construction.

XYZ TYPE CLUTCH WITH SHEAVE WHEEL MOUNTING

Patented in U.S.A. and Canada

Write for bulletins



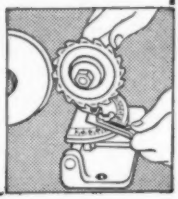
THE CONWAY CLUTCH CO.

1541 Queen City Ave.
Cincinnati 14, Ohio

NEW TOOL GRINDER

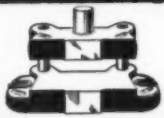
Grinds Milling Wheels, Slitting saws, Lathe Tools, Wood Turning Chisels, Many Small Tools to any Degree or Angle.

Write for Literature.



T. & H. MFG. CO.
811-3 East 31st
Kansas City 3, Mo.

BAUMBACH



STANDARDIZED
Machined Steel **DIE SETS** Semi-Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die set that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.
1810 So. Kilbourne Ave., CHICAGO, ILL.

reservoir in which gear operates. Inner housing wall forming oil reservoir is deeply finned on the air side, resulting in a marked increase in heat-dissipating surface.

An exhaust fan located on coupling end of worm shaft draws air at high velocity thru space between housing walls from a grill at opposite end of unit. This fan is designed to operate with either direction of rotation. Effect of the double wall construction is to maintain a uniform flow of cooling air against the fins and housing wall over the whole oil reservoir surface, thus completely utilizing the full heat transfer efficiency of the system.

Operating temperature is greatly lowered by means of this high velocity air stream enveloping the oil reservoir, giving the Speedaire unit a much greater load-carrying capacity than a standard worm gear unit of equal size, when operated at usual motor speeds.

In many instances it is possible to obtain an operating capacity with Speedaire units equal to that of standard worm gear units having approximately double the housing dimensions. Under given conditions of installation an advantage may be derived from reduced size or reduced weight. In either case there is a material reduction in the dollar cost per hp transmitted.

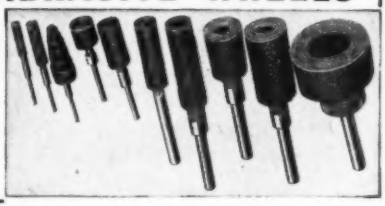
STAINLESS STEEL ELECTRODES

The Alloy Rods Co., York, Pa., announce a new stainless steel arc welding electrode, that performs equally well on a-c or d-c in all positions.

All stainless steel analyses are now available for operation on a-c or d-c current. These electrodes offer exceptionally low spatter loss, easily removed slag, and instant arc establishment. Welds made in the flat, vertical, and overhead positions are of accepted contour. Physical and corrosive resisting properties are claimed to meet all requirements.

The Sensational New Patented, Perforated, Continuous Roll!
FIELD FLEXIBLE ABRASIVE WHEELS

Designed for precision work where flexibility is required. Indispensable for sanding and finishing . . . penetrating recesses, lapping holes in dies, finishing various shapes of metal, wood, rubber and plastic. Used for finishing propellers in aircraft plants. WRITE FOR DESCRIPTIVE BULLETIN AND SAMPLE. Prompt deliveries.



FIELD ABRASIVE SPECIALTY MANUFACTURING CO.
203 LOWE BLDG. DAYTON 2, OHIO



WITH Mall PORTABLE POWER TOOLS

FOR PRODUCTION
SHIPPING and MAINTENANCE

ELECTRIC MALLSAWS—assure faster, accurate cuts, square board ends, and better fitting. Boards of like length can be gauged and cut at one time. Safety guard provides full protection. Model 80—8" blade, 2½" cutting capacity; Model 120—12" blade, 4½" capacity.

One **ELECTRIC MALLPLANE** will do the work of 10 men equipped with hand-propelled jack planes and do a smoother, better job. Cuts ⅛" deep and 2½" wide can be made in both pine and hardwood with speed and precision. Depth of cut can be varied while cutting 0" to ⅛". Full ball-bearing with grease encased gears.

¼" **ELECTRIC MALLDRILL**—the most powerful, cool-running, little drill on the market for drilling wood, metal and composition materials. Weighs only 3 lbs. without cord. Rated motor speed 2200 r.p.m. Tailor made for close quarters. Easy to use with either hand. Operates on A.C. or D.C. Commutator easily and quickly serviced. Brushes can be replaced from outside without dismantling drill.

Ask your Supplier or write for Catalog.

MALL TOOL COMPANY, 7742 South Chicago Ave., Chicago 19, Ill.

ARMY E NAVY

Mall REG. U.S. PAT. OFF. PORTABLE POWER TOOLS

IMMEDIATE DELIVERY OUT OF STOCK

PORTABLE TOOL STAND



Green Enamel Finish.
18" Wide, 24" Deep, 32" High.
Legs are 1½"x1½"x⅛"
Angle Steel Swivel Casters for Free Moving.
Shipped K.D. Complete with Bolts,
$13.75 ea.
F.O.B. Chicago.
Priority Must Accompany Order.

Can be quickly moved along the assembly line or from job to job. Saves time frequently wasted during trips to a tool bench. Tools may be locked up when not in use in the 12"x20"x4" drawer and in the 3" deep top tray. Trays are of 16-gauge. Strong hasps and loop can lock both the hinged top and drawer securely with one padlock.

PASSMAN BROTHERS
1101 W. Lake St. Chicago 7, Ill.

ALL ALLOY **PORTABLE SHEARS**

FULLY GUARANTEED



Two Sizes

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.

Special Blades for shearing stainless steel.

BREMIL MFG. CO.
720 Pittsburgh Ave., Erie, Pa.

PRECISIONPLATE THREAD GAGES



A method of uniformly and adhesively bonding chrome to the full thread form on a thread gage, with the trade name of "Precisionplate", is announced by The Sheffield Corp., Dayton, Ohio. This special process enables the adhesion, the toughness and the thickness of the chromium to be controlled to an unusual degree of precision.

It is claimed that the chromium is actually bonded to the steel with such adhesion that "Precisionplate" plugs are extraordinarily chip-resistant. The microphoto shows the chrome is relatively uniform from crest, over pitch diameter, to the root, making it possible for the gage to give a more accurate check thruout its entire life. Laboratory checks and field tests prove life averages four to six times that of conventional steel.

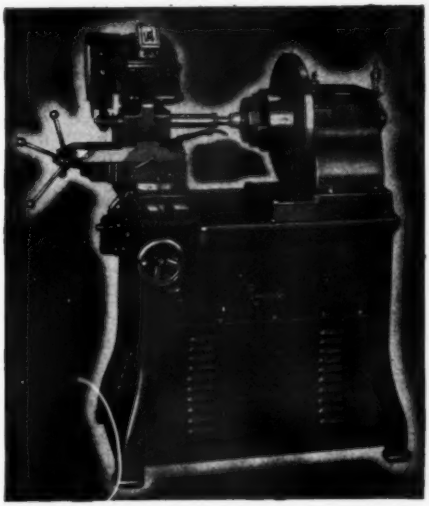
Among the advantages claimed for "Precisionplate" is the increased resistance

METAL STAMPINGS IN SMALL LOTS

ECONOMY and ACCURACY are the two factors to be considered when Die Cut Metal Stampings in limited quantities are needed. Our booklet, "Metal Stampings in Small Lots", will explain to you how accurate die cut parts can be produced at a very low cost.

Write for your copy of booklet No. 176-7.

DAYTON ROGERS MFG. CO. 2835 - 12TH AVE. S' MINNEAPOLIS 7, MINN.



FOR

POST-WAR FLEXIBILITY

A *NEW* INTERNAL AND FACE GRINDER

Its sturdy heavy-duty construction enables it to grind out wartime production jobs hour after hour, day after day. Yet it's versatile enough to take a wide range of work since it turns and grinds internal, external, face and taper jobs. Its quick set-up features make it practical for tool room, tool and die shops, as well as ideal for the varying jobs post-war conversion will require. Exclusive Lempco Auto-Sizer. Ceiling-priced! Good delivery!

WRITE FOR SPECIFICATIONS

LEMPCO

5729 DUNHAM ROAD
BEDFORD, OHIO • U★S★A

to corrosion caused by handling or the atmosphere, as well as scoring, marring, and other damage due to rough handling. Gages finished with the new process will outwear several steel gages on the same job. "Precisionplate" thread plugs are stocked in standard sizes and have an accuracy of Class X tolerance in lead, angle, and pitch diameter. Special "Precisionplate" plugs can be made to order.

TUBE AND COUPLING MARKER

The new Cunningham Tube and Coupling Marker facilitates stamping of tubes and couplings from one to 16" in length. It is quickly slipped into position, clamping under both ends of the tube or coupling being marked. A non-slip knurled handle readily locks the Marker firmly in position with no further adjustments necessary. The Marker is released by merely lifting up on handle.

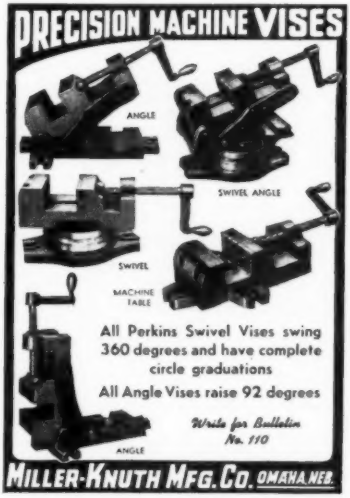
Figures are constructed of Cunningham Safety Steel, so the Tube and Coupling Marker affords safety with clean, clear marking and high speed operation. The Marker is available for various amounts of characters, depending on size of Marker and of the characters.

Further details are available from M. E. Cunningham Co., 228 E. Carson St., Pittsburgh 19, Pa.

NATIONAL ACME CATALOG

A new, 56-page catalog D-42, devoted to automatic dies, taps and hollow mill heads has been issued by The National Acme Co., 170 E. 131 St., Cleveland, Ohio. All members of the family of Namco precision threading tools are introduced and described. There are typical examples of work, suggesting applications of the different tools. Photographs, detail drawings and specifications are given. Special threading equipment for the industry is included, also hand feed tool and chaser grinders in a number of sizes, along with grinding fixtures and adaptors.





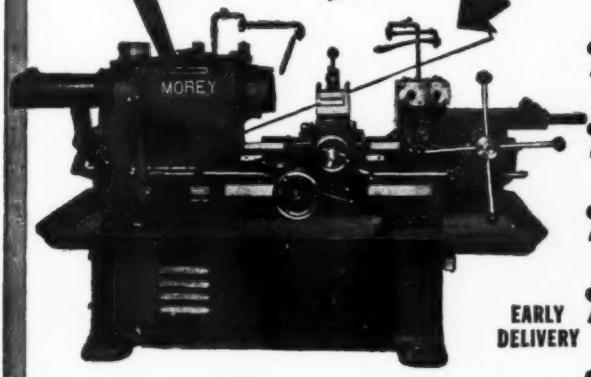


MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL

For bar stock up to 1¼" in diameter
10" turning length
18½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM., constant speed motor. 1200 RPM

AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.
- BED MOUNTED ON CABINET BASE.
- MOTORS AND STARTING EQUIPMENT EASILY ACCESSIBLE.
- HEXAGON TURRET AUTOMATICALLY UNCLAMPED, INDEXED AND CLAMPED.
- THREE TYPES OF CROSS SLIDES AVAILABLE:
  Lever Feed
  Screw Feed
  Combination Feed*
  *Combination feed provides instantaneous selection to either lever or screw feed.
- EIGHT (8) FEED CHANGES FOR THE UNIVERSAL CARRIAGE and HEXAGON TURRET, INSTANTLY ENGAGED OR DISENGAGED BY ONE MOVEMENT OF THE LEVER.

#2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 8½"
Swing over cross slide 8"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 80 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 929A

#4 UNIVERSAL

For bar stock up to 3" in diameter
12" turning length
18½" swing over bed
Infinite spindle speeds: 35 to 1200 RPM. constant speed motor. 1200 RPM

AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 728A

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE JOB WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC.
410 BROOME STREET, NEW YORK, N. Y. Plant: 45-57 26th AVE., ASTORIA, NEW YORK

PART NUMBERS

LETTERING

GRADUATIONS

ROLLED

BY MACHINE

ON

FLAT & ROUND SURFACES

Sure - Fast - Accurate

OBSOLETES HAND STAMPING

SAVES { PARTS / LABOR / STAMPS

Eliminates POOR MARKING ERROR — NOISE

Speeds . . DELIVERIES



MODEL 175

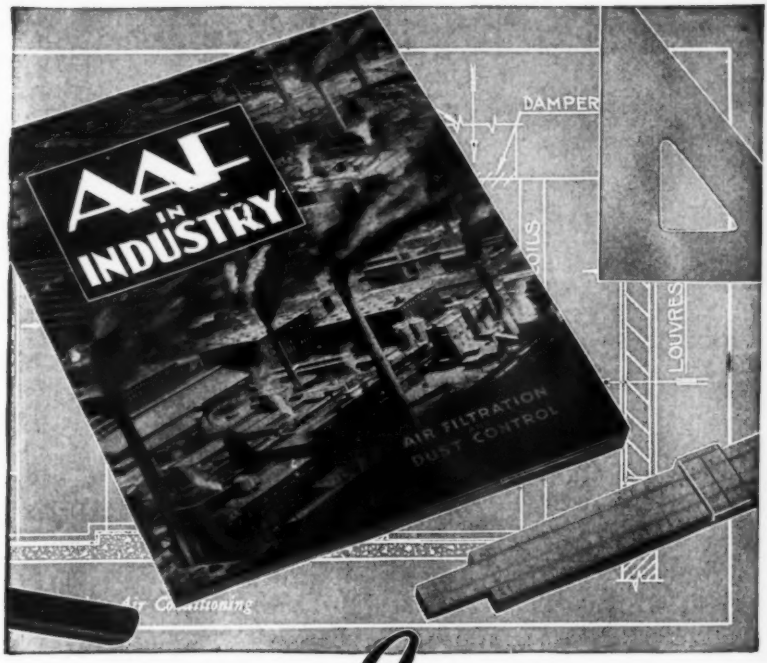
ALSO ADAPTED TO CERTAIN KNURLING OPERATIONS

This Hydraulic Machine will mark piece parts quickly and accurately. It is serving in the war effort in many plants for marking components of guns, tanks, planes, motors, engines, shells, and practically every metal part produced for war equipment. Machine will mark unlimited number of sizes and shapes when equipped with proper tools and fixtures. It will also do an excellent knurling job on solids and shells of small diameters.

Designed and Built By

GEO. T. SCHMIDT, INC.

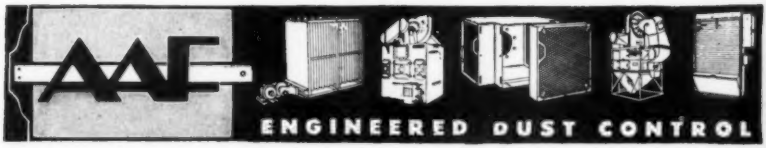
1802 BELLE PLAINE AVENUE CHICAGO 13, ILLINOIS



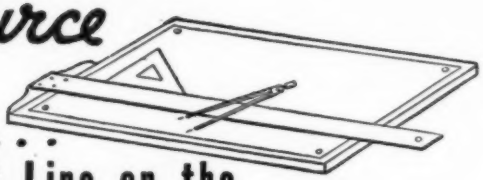
Just released . . .

YOURS FOR THE ASKING — 34 pages packed full of valuable information on the control of atmospheric and process dusts, including engineering data. Write today American Air Filter Company, Inc., 312 Central Avenue, Louisville 8, Kentucky.

In Canada: Darling Bros., Ltd., Montreal.



A Complete Service at One Source



EVERYTHING . . .
From the First Line on the Drafting Tables to the Finished Product



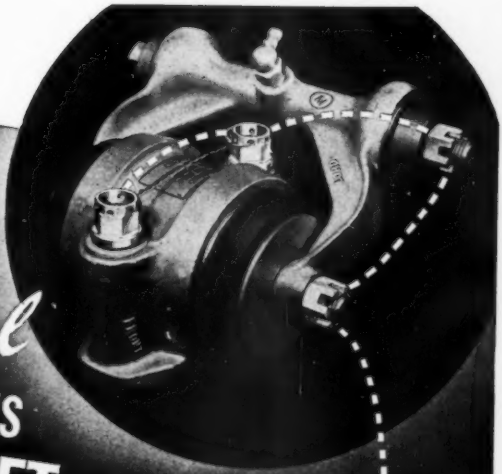


Whether it is tools to produce, or the production itself. We work from rough idea. Part print — sketch — or just talk it over with us. Inquiries will bring prompt quotations.

Tools — Dies — Jigs — Gages — Fixtures — Special Machines—Production of parts in large quantities — Production of assemblies from raw material to finished product. — In addition to our own equipment we have extensive subcontract outlet.



EAGLE TOOL & MACH. CO., INC.
1101 and 1925 W. Main St., SPRINGFIELD, OHIO
ENGINEERING • DESIGNING • DEVELOPMENT



FOR *Vital* JOBS IT'S AIRCRAFT "Tailor Made" NUTS

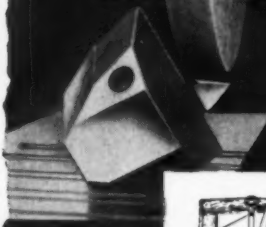
Vital Precision equipment such as the Lord RL-25 Dynafocal assembly for Wright R-2600 Radial Aircraft engines demand the finest precision made nuts on the market. That is why Aircraft "Tailor Made" nuts are used.

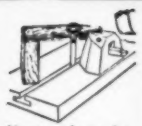
These assemblies must withstand the unbalanced forces produced by these engines and Aircraft "Tailor Made" nuts have the very important role of keeping assemblies tightly held together at all times under every conceivable condition.

Perhaps you have a need for precision made nuts; if so, send us your blueprints; we will be only too glad to quote prices.

Aircraft
NUT CORPORATION
2029 EAST 102nd ST.
CLEVELAND, OHIO

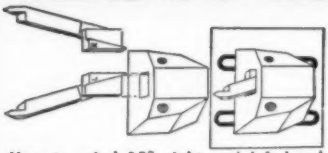
Only ONE FIXTURE NEEDED to grind both 60° and Acme 29° Thread-Tool Bits





How to clamp fixture to work table when magnetic chuck is not available.

One Clark Thread - Tool Grinding Fixture handles both National 60° and Acme 29° left or right hand thread-tool bits, with or without rake on the cutting face . . . Eliminates old method of trial and error . . . no graduated scales or movable parts to wear . . . Two sizes, complete with adaptors: Model A for the mechanic's tool kit $16.75 . . . Heavy Duty Model B for the shop $35.00.



How to grind 15° right and left hand bent tools with standard adaptors.

SEE YOUR CLARK CUTTER JOBBER TODAY!

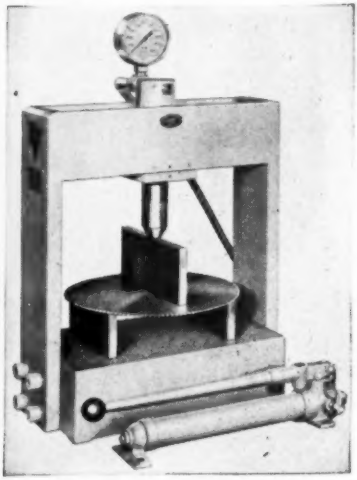
Or write for new catalog—Dept. MTBB 10

Robert H. Clark Company

"In the New Industrial District"
Beverly Hills, California

LABORATORY PRESS

A new laboratory press has been added to the Anderson line of Presses. It has a total capacity of 20 tons or 40,000 lbs with a stroke of 5". The table is 12x20" and is accurately machined.



Power is derived from a hydraulic hand pump, a unit that has proved its merits on the standard line of hand presses.

No table or stand is shown but one can be furnished to suit requirements.

In addition to the use as a laboratory press, this unit can be employed for many production straightening jobs; such as, large sprockets, gears, plates, etc. A large sprocket is shown in place on the machine. Weight of this new press is 400 lbs and it is made by Anderson Bros. Mfg. Co., Rockford, Ill.

New Nesting Type Tote Pans



20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.

BRIDGEPORT, CONN.



TOUGHNESS YOU TAKE FOR GRANTED

There are no better symbols of rugged power and tough durabilities than a freight "hog" and the rails on which it runs — unless it's the tough, efficient little tools that drill them.

Celfor tools got their start drilling rails — and have been drilling effectively ever since: are, in fact, frequently chosen for the toughest jobs.

Here, indeed, is toughness you can take for granted. How the Celfor Process preserves and increases the inherent strength and stamina of finest tool steels is well illustrated by the Celfor Type B Reamer, made only by Clark; and equally proved by the Celfor high speed Twist Drill, forged to shape and hot twisted to densify and toughen the metal. No tools can surpass Celfors for cutting qualities and long, useful life. We know—for we make them. A good start toward lower tool costs and faster, easier drilling is to write us for full data.

CELFOR

Another PRODUCT of CLARK EQUIPMENT COMPANY

CLARK EQUIPMENT COMPANY

BUCHANAN, MICHIGAN

OTHER CLARK PRODUCTS—**AXLES** (Front and Rear) **FOR TRUCKS AND BUSES • AXLE HOUSINGS TRANSMISSIONS • METAL SPOKE WHEELS • ELECTRIC STEEL CASTINGS • GEARS AND FORGINGS • RAILWAY CAR TRUCKS • BLIND RIVETS • INDUSTRIAL TRUCKS AND TRACTORS**

UNIVERSAL VISE

FOR CENTER DRILLING AND MILLING

Do away with guess work on cross center drilling of round or hexagon stock. No moving parts are involved, guaranteeing accuracy. Bushings are interchangeable giving wide range in hole sizes. Vise is equipped with 1/8" drill bushing. Since all surfaces are precision ground it can be used with any type of machine tool as a work holder and permanent accuracy is assured. Has V block with opposing jaw for unobstructed work. See your dealer or write us today.

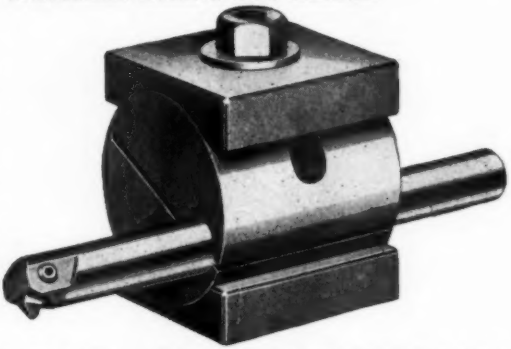


Universal Engineering Co.

2230-32 NATIONAL AVENUE • SAN DIEGO 2, CALIFORNIA

WELCH UNIVERSAL BORING BAR HOLDER

A new universal boring bar holder, with up and down adjustment to center, has been developed by the Welch Tool Engineering Co., 3011 Verdugo Rd., Los Angeles 41, Cal.



In connection with this new holder, it is emphasized that the new adjustment, in addition to all standard adjustments, eliminates waste time in shimming and enables operator to locate cutting tool on center quickly.

The device is exceptionally sturdy and rigid, being made entirely of bar steel . . . no castings are used. The holder fastens directly in tool post T slot on the compound rest. Boring bar is always level and parallel with spindle of lathe. The device can be used for turning as well as boring operations.

Tightening one nut locks holder and bar rigidly in position. Any size bar can be used, up to the capacity of the holder, by inserting split bushings.

Two standard sizes are carried in stock, viz:—No. 1—8 to 10" lathe (2" cylinder) 5/8" maximum bar; and No. 2—12 to 16" lathe (3" cylinder) 3/4" maximum bar.

Standard equipment includes one double end bar. Special sizes will be manufactured to specification. It is important when ordering to give dimensions of T slot in tool post holder.

★ CENTERLESS GRINDING

Straight Cylindrical, Shoulder, Profile, and Multiple Diameters . . . Long Bar Grinding . . . Ground Taper Pins and Dowel Pins.
Screw machine products. Heat treated and ground if necessary. Improved and expanded facilities assure prompt and accurate service.
Send your blue prints or samples for estimates.

PORTER MACHINE COMPANY
3100 Enyart Ave., Oakley, Cincinnati, O.

BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

"BASIC UNIT + PARTS" PLAN

Gives you EXACTLY the High Speed Production Lathe you need – *at Lowest Cost*



(LEFT) BASIC UNIT OF THE MINNEAPOLIS PRODUCTION LATHE to which you can add only the equipment needed for your particular production "set-up". 4 different drives.

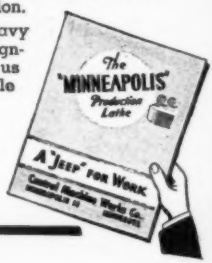
(RIGHT) A SET-UP "TAILOR-MADE" FOR CUSTOMER'S NEEDS

Here is a "set-up" as ordered by a customer, including Basic Lathe with All-Electric Multi-Speed Drive (50-1500 RPM)—hollow stationary Air Cylinder—rack and pinion Cross-Slide with longitudinal power feed—6-station heavy-duty Turret with power feed—also complete special tooling.

SMALLER INVESTMENT — Lower Production Costs

The "MINNEAPOLIS" Production Lathe is extremely adaptable to any production set-up, particularly second operation work. Its simplified design and ease of control enable inexperienced operators to turn out high speed volume production.

The "MINNEAPOLIS" has 2¼" collet capacity, 14" swing, heavy duty spindle assembly. It is backed by more than 50 years designing and manufacturing experience. Send for literature — write us your production problems. Send sample part or drawing if possible — let us quote you on a "tailor-made" lathe for your work.



CENTRAL MACHINE WORKS CO.

Machinery designers and manufacturers since 1890

1222 Central Avenue, Minneapolis 13, Minnesota

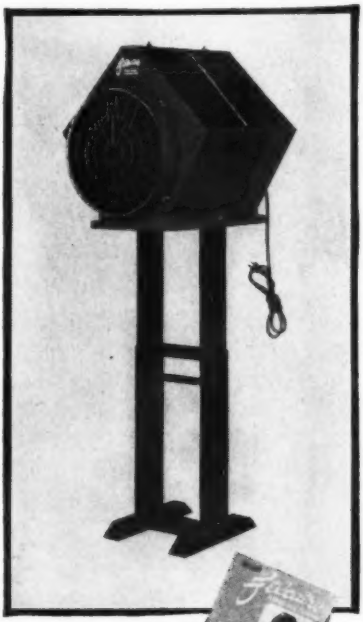
Filtaire No. 2 DUST COLLECTOR

COMPACT
PORTABLE
ECONOMICAL

Hundreds of Filtaire Dust Collector installations have proven their efficiency and economy, and have also proven their adaptability to dozens of types of dust collecting jobs in shops throughout the country.

If you do dry grinding or polishing, if your processing creates dust that floats in the air — it will pay to install a Filtaire at every trouble spot.

The No. 2 Filtaire Portable Dust Collector soon pays for itself, because it eliminates the dust that often ruins machine tools, fans, pumps, bearings, etc. It *recirculates* warm air instead of expelling it from the shop, so you save on fuel bills, too!





The coupon will bring you this new Filtaire Bulletin which has full details. Send for your free copy today.

Please send me Bulletin No. 444 which describes the Filtaire in detail. H

NAME_____ TITLE____

COMPANY_____

STREET_____

CITY_____ STATE_____

EDWARD BLAKE CO.
634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

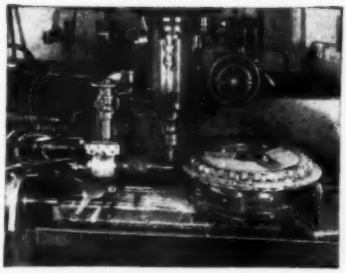
BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—
BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

CAN YOU *Equal* THIS SPEED IN MACHINING SPROCKET TEETH ?

33-Tooth Sprocket Machined In 31 Minutes with a Turchan!



Here's How It's Done!



This feat of the Turchan Follower, in roughing and finishing a 21⅞ diameter, 33-tooth sprocket of 1" steel (SAE 4140) in 31 minutes on a milling machine, clips 44 minutes off the time required to perform the same operation with gear cutters.

Equally amazing is the way the Turchan Follower cuts down the time of machining practically any part of irregular or eccentric shape on lathes, shapers, grinders, planers, and boring mills.

If you would like to know how much the Turchan will speed up the production rate on any part, send us the part or a blueprint for an estimate.

SEND US
Sample or Blueprint of Parts for Turchan Production Estimate

"Turn to Turchan"

Turchan Follower Machine Co.
8253 Livernois Detroit 4, Mich.

TURCHAN
Hydraulic Follower Machine

MODEL BBS BENCH TYPE BELT GRINDER

As an addition to their line of Abrasive Belt Grinders, Porter-Cable Machine Co., 300-8 Exchange St., Syracuse, 8, N. Y., announces their new Model BBS Bench Type Belt Grinder.



This new unit uses an endless metal cutting abrasive belt 2½" wide x 60" long, running 4500 sfpm, driven by a one hp motor. The design provides a flat bed grinding area 2½"x8" as well as a soft resilient contact wheel 7" in diameter by 2½" wide, which is adaptable for grinding all types of metal. Wheels 6" to 8" in diameter can be used—arbor 1". The whole unit is ruggedly constructed and is said to operate with freedom from vibration.

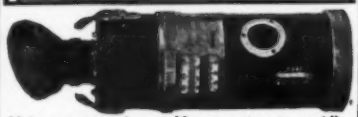
This type of Bench Grinder is especially adapted for burring gears, weld grinding, generating radii, removing flash, flat and edge work, cleaning-up and polishing. The machine can be furnished with or without motor.

HARDENING TAPS AND DIES

An interesting discussion of salt bath heating in the hardening of high speed taps and dies has been published by the Ajax Metal Co., Frankfort Ave. & Richmond St., Philadelphia, Pa. The author is Paul C. Farren, Chief Metallurgist, Greenfield Tap and Die Corp., Greenfield, Mass.

Mr. Farren discusses the wide adoption of molybdenum alloys forced by the war; in substitution for tungsten alloys and the ensuing changes in heat treating technique. He points out the advantages of the electric salt bath treatment in minimizing distortion and eliminating surface defects in the case of cut thread tools. Mr. Farren describes the handling technique, tempering and straightening methods, furnace operation and maintenance, and metallurgical inspection. Considerable interesting and useful information is presented.

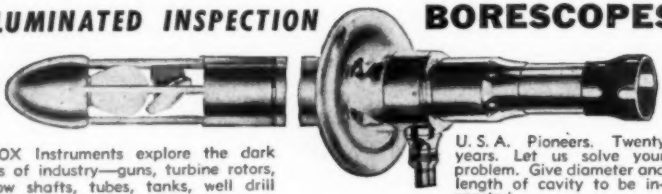
PYRO THE SIMPLIFIED OPTICAL PYROMETER



Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO.
102-105 Lafayette St., New York, N. Y.

ILLUMINATED INSPECTION BORESCOPES



LENOX Instruments explore the dark holes of industry—guns, turbine rotors, hollow shafts, tubes, tanks, well drill pipe, cartridge cases, etc.

U. S. A. Pioneers. Twenty years. Let us solve your problem. Give diameter and length of cavity to be inspected.

LENOX INSTRUMENT COMPANY
2008 CHANCELLOR ST.
PHILADELPHIA 3, PA.

READY FOR EARLY DELIVERY!

ABRASIVE

No. 1½



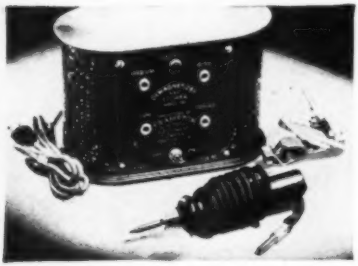
HAND FEED SURFACE GRINDER

Abrasive No. 1½—the ideal machine for short-run precision jobs—produces the finest type of flat, form and gage grinding.

Large capacity, 15" long x 10" wide x 12" high; motor and spindle integral, without belts, chains or dangerous moving parts; convenient handwheels for effortless operation. Women operators readily produce work of extreme accuracy. Send for Bulletin.

ABRASIVE MACHINE TOOL COMPANY, Dealers in Principal Cities, East Providence 14, R. I.

FRAMPTON DEMAGNETIZER-ETCHER



An improved type of Demagnetizer and Etcher has been announced by Frampton Electrical Equipment Co., 224 Hickory St., Dayton 10, Ohio.

The new unit is compact, sturdy and portable, weighing only 16 lbs. It will demagnetize any size tool or die. Parts to be demagnetized are simply passed across the poles or, if they are large and heavy, the Demagnetizer is simply moved across their surfaces.

Etching is performed by plugging the etching pencil into one of three jacks marked "Low", "Medium" and "High", depending on the wattage to be used. Metals of any thickness may be etched. The unit is designed for use with 110-volt, 60-cycle, single phase circuit.

HEAVY DUTY POLISHING LATHE

A new polishing lathe for heavy duty work is announced. Known as the Jones Heavy Duty Polishing Lathe No. 143, the unit is designed for bench or stand mounting. It is a production machine and employs two Jones Contact Rolls equipped with fast-cutting, endless abrasive belts.

The No. 143 Lathe is built for two 14"-diameter, 3"-face contact rolls, has a 1-11/16"-diameter shaft and is 34" overall length. Spacing between inside faces of wheels is 24"; width 9" from base to center of shaft. Longer shafts are available at a slight additional cost. Unit is equipped with a 3-groove V-Belt Motor Shaft, and is used with a 2, 3 or 5-hp motor. Motor mounts underneath bench or stand where it is free from dust and dirt.

Full details are available from Jones Engineering Co., Ellwood City, Pa.

SMITH MASTER SURFACE PLATES

HOLD THEIR PRECISION

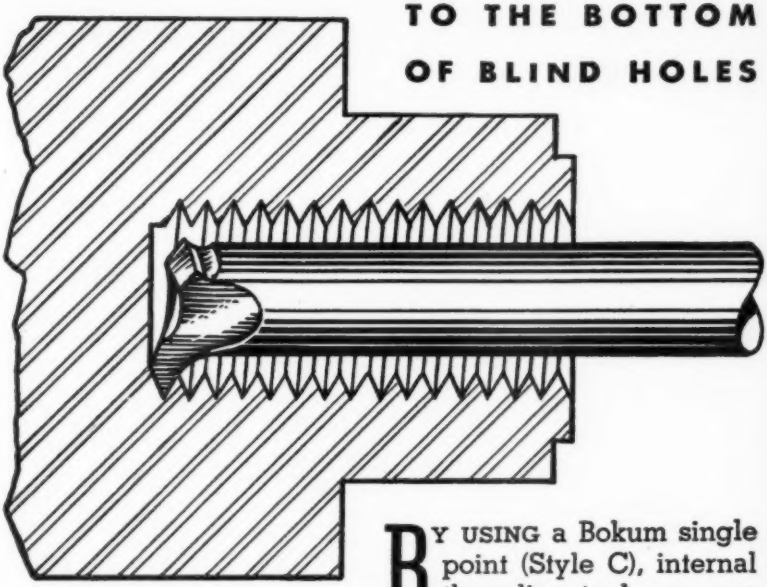


Even the weight of a feather will produce some deflection in the working face of a Surface Plate. But the Smith scientifically designed, deep, elliptical ribbing and sturdy cross-bracing limit deflection under loads to a very minimum. Lapping plates of the same design, and stands as shown also available.

SMITH TOOL & ENGINEERING CO.
854 N. SANDUSKY AVE., BUCYRUS, O.

How To Make *PERFECT THREADS*

TO THE BOTTOM OF BLIND HOLES



BY USING a Bokum single point (Style C), internal threading tool, you can produce threads clear to the bottom of blind holes. The shank being in line with the cutting edge of tool, the angles of all the threads are perfectly true. Sharpening is done on only one face without disturbing or changing the angle. No other tool like it.

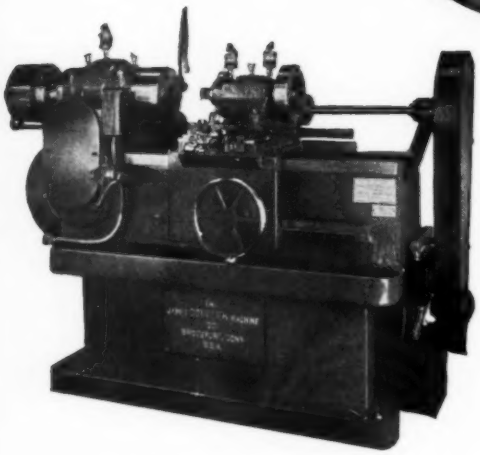
Bokum tools of the same type are also available for general boring (Style A), and for bottoming and facing (Style B).

For super High Speed Tools ask for Catalog H-1139 and for Carbide Tipped H-398.

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

THE COULTER HOB THREAD MILLER



FOR THE RAPID DUPLICATION OF RIGHT OR LEFT HAND THREADS —INTERNAL OR EXTERNAL

Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chucks, or special face plate fixtures . . . can be threaded on this machine.

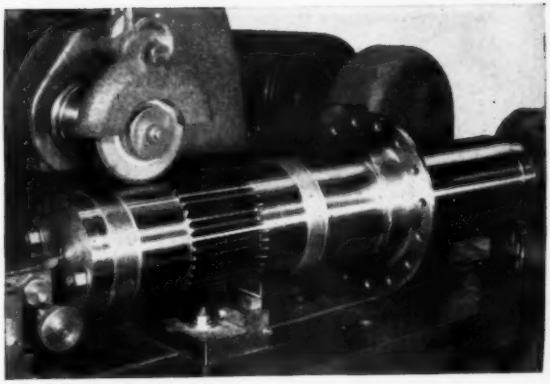
Set cam-controlled automatic cycle on first piece. Thereafter, cutter feeds into work to proper depth and at correct pitch and withdraws when cut is completed. Work and cutter spindles are driven by individual motors through worm drive, affording ample power throughout the wide range of speeds and feeds.

Write for Details and Specifications.

The James COULTER Machine Co.

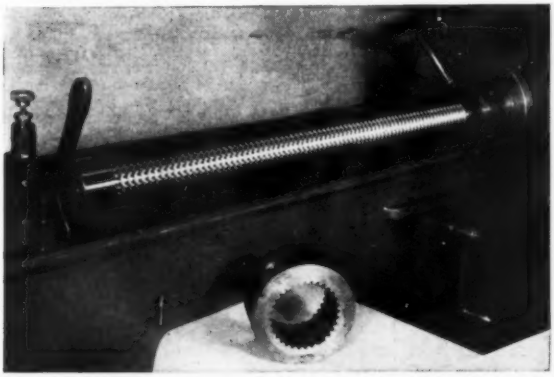
BRIDGEPORT • CONNECTICUT • U.S.A.

Dual Rotation Hollow Aircraft Propeller Shaft



"In the Spotlight" **for post-war**

SPLINE BROACHES UP TO 84 INCHES LONG. Complete Broach Tooling and Engineering Service . . . GAGES, Serration or Spline, male or female . . . Master Gears and Gear Racks . . . Master Index Plates . . . Splined Arbors for gear-grinding . . . Hobbing, Shaving and Checking . . . Production Broaching and Machining.



Involute Spline Broach and part of Wrench being Broached for Aircraft Engine Crankshaft.

GL B&G Co.

GREAT LAKES
Broach & Gage Company
1005 FRANKLIN STREET DETROIT 7, MICHIGAN



POWERFUL PRESSES THAT USE NO POWER

Famco Arbor Presses deliver 1,000 lbs. to 15 tons pressure, need no wires, motors, line shafts or power. Widely used with girl operators for assembly and dismantling jobs. All 32 stock sizes, bench and floor types, are easy to operate, take small space, ruggedly built yet readily portable.

FAMCO MACHINE CO., 1320 18th St., Racine, Wis.

famco

ARBOR PRESSES
FOOT PRESSES
SQUARING SHEARS

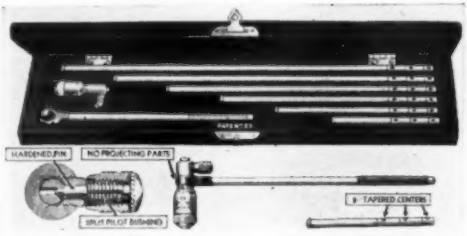
Famco Squaring Shears will cut up to 18 gauge mild steel. Made in five sizes. Powerful, rugged, accurate, easy to operate.



Famco Foot Presses, bench and floor types, are ideal for speeding up numerous light forming and stamping jobs



INTERNATIONAL INSIDE MICROMETERS



A new International Inside Micrometer is announced by Brand Tool & Supply Co., 500 W. Washington Blvd., Los Angeles 15, Cal. It is now furnished in two sets from 1½" to 12 and 1½ to 6", and instead of the usual wooden case, is fitted with a streamlined plastic case.

Another improvement is that the hardened and adjustable measuring points on the head itself and on the adjustable rods have been streamlined by making the point of contact smaller, which makes it easier to get the "feel" of a hole that has to be measured. The large spring type screw in the head gives snug and even tension at all times. This tension may be adjusted to suit requirements of the user. Markings on the micrometer head itself are easily readable because they are deep and clear. Each set is guaranteed for accuracy and workmanship.

ARMSTRONG TOOL CATALOG

A new catalog C-39b has been issued by Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago 12, Ill. In handy, pocket size, the catalog presents 224 pages of interesting information on the Armstrong line of shop tools. It is a very comprehensive presentation of Armstrong tool holders, cutting off tools, side and boring tools, threading and knurling tools. Also included are Armstrong high speed bits, cutters and blades and Armite cutters. The book is an interesting and helpful manual of shop tool equipment.

MOTOR MICA

ANTI-FRICTION COMPOUND

SERVING INDUSTRY FOR 30 YEARS

Cools hot bearings.
Solves toughest lubricating problems.
Saves wear on moving parts.
Works wonders with cutting oils.
Packed in 5-10-25-50-100 lb. containers.

QUICK SHIPMENTS

Write — Wire — Phone your Order today!

SCIENTIFIC LUBRICANTS CO.

3469 N. Clark St. Est. 1914 Chicago, Ill.

SCHAUER Speed Lathes

Ideal for polishing, de-burring, lapping small metal and plastic parts.



Ask for Cat. 440

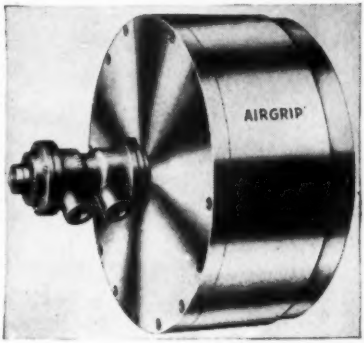
SCHAUER MACHINE CO., 2064 Reading Rd., Cin'ti, O.

Give WINGS TO PRODUCTION!

"Airgrip"

Revolving Air Cylinders

"AIRGRIP" Revolving Air Cylinders, on double ball bearings permit speeds formerly impossible. Minimum maintenance. Today's top speed and peak efficiency requirements in air chucks demand superior air cylinder performance and service. Under average conditions, the cylinder will run for years without attention. No manual adjustment of packings. Wear automatically taken up by air pressure within the cylinder.



"AIRGRIP" CHUCKS

Boost output records, slash costs. "Airgrip" Chucks double gripping power, externally or internally. Work held tight, even if air supply is cut off completely. "Airgrip" 2- and 3-jaw Universal Chucks permit heavier cuts; coarser feeds.

HI-PO SUPERCHARGED HYDRAULIC PRESSURE PUMPS

3000 lb.-Pressure Pump, driven by a ½ h.p. motor! Double-Pressure Production; low-pressure section supercharges a high-pressure section. Builds up pressure fast, with minimum pulsation.

Write us for Bulletin, and consult Anker-Holth Engineers on pneumatic or hydraulic applications.

Anker-Holth Mfg. Co.

2729 CONNORS STREET PORT HURON, MICHIGAN

SLIP ROLL FORMING MACHINES

LOWN

POWER-DRIVEN — NEW TYPE
4″ DIAMETER



Early Deliveries Available

This sturdy former is of the latest improved design ruggedly constructed for heavy-duty service. The slip roll feature makes it easy to remove formed materials from the machine.

The rolls are of tough steel, turned and polished. Bottom and backup rolls have circular grooves for forming work with outside wire edges.

All machines are supplied complete with motor and drum type reversing switches. Sizes range from 38″ to 98″ roll length and will be furnished with all three rolls power driven if desired.

Heavier motor-driven machines are also available either in initial or pyramid type. We can also furnish lighter hand-powered bench and floor type machines. Let us send you descriptive literature.

SAN ANGELO FOUNDRY & MACHINE COMPANY
SAN ANGELO, TEXAS, U. S. A.
"Dealers in Principal Industrial Cities"



GRIPPING FORCE 15 TIMES AIR LINE PRESSURE!

America's war plants are switching to new, powerful Speedy Air Vises! From a single vise . . . to an installation of fifty . . . they are saving time, effort and labor costs! Air operated, *foot controlled*—both hands are left free for more rapid drilling, tapping, light milling, assembly, etc. Complete with Foot Control Valve, Air Hose and Fittings, only **$24**

DELIVERY 7-10 DAYS! ORDER FROM YOUR MILL SUPPLY DEALER OR WRITE DIRECT



AIR REGULATOR

Precision-built. Delivers pressures up to 140 lbs. With gauge, $4. Less gauge, $2.50



AIR FILTER

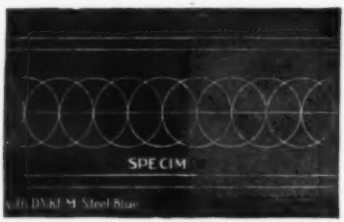
Keeps water and particles out of the regulator and pneumatic tools. $1.50

BLOW-GUN

Looks and operates like a gun. Ideal for cleaning and blowing out chips, dust, filings, scraps, etc. . . . $2.50



W. R. BROWN CORP., 5724 ARMITAGE AVE., CHICAGO 39, ILL.



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2301G N. 11th St., St. Louis, Mo.
(In Canada: 444 Pacific Ave., Toronto, Ont.)

JOHN'S DRILL JIGS
For Tapping Machines

These jigs are now provided with universal jaws which permit quick set-up for end drilling and tapping.

The reversible V plates will accommodate a large range of diameters.



WRITE FOR DETAILS.

HEUSER MFG. CO.
1638 N. Pauline St., Chicago, Ill.

CARBIDE THREAD GAGES



A complete line of carbide thread plug gages is announced by Jansson. Extreme care in grinding operations makes these gages accurate to exceptionally close tolerances. The wear-resisting properties of carbide assures continued accuracy over longer periods of time.

Three styles of carbide thread plug gages are offered, made to American Gage Design standards. Solid carbide is used for the smaller size gaging members. Larger sizes have a carbide bushing over a steel body. All gaging members are ground from solid carbide.

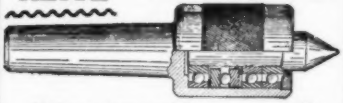
A complete size range is available from .112" to 3", accurately ground to Class X or Class Y tolerances. Any pitch can be supplied in American National Form.

Additional information may be obtained by writing Jansson Gage Co., 19208 Glendale Ave., Detroit 23, Mich.

UNIVERSAL CUTTING TOOLS

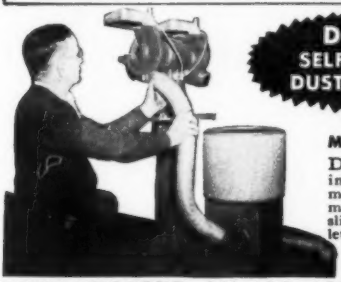
Special information on ground thread cutting tools and hobs is contained in Bulletin 644 issued by the Universal Engineering Corp., Cedar Rapids, Iowa. This company manufactures the U-6 Automatic Thread Milling Machine, and offers descriptions and instructions to customers on the ordering and selection of hobs, taps, cutters and leaders known as the Uneco Line. Illustrated with half tones and engineering drawings, the booklet also tells about the operation of the U-6 and gives data on special gages, jigs and fixtures. It will be sent without obligation on request.

"ALIVE" Ball Bearing Centers



"They turn with the work"
Write TODAY — and let us tell you more about them.
MODERN MACHINE COMPANY
323 Berry Street BROOKLYN, N. Y.

Quick way to STOP DUST!



DUSTKOP
SELF-CONTAINED
DUST COLLECTORS



MODEL 600
DUSTKOPS are installed in a few minutes. Flexible metal hose makes slip fit with dust outlets on grinder.

MODEL 950
This unit, with dust hoods, "ready to go," fits any double-end pedestal grinder not already equipped with wheel guards and dust outlets.

DUST STOPPED ON ALL ABRASIVE OPERATIONS AT LOWEST COST

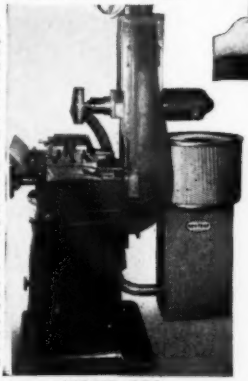


MODEL 600
With flat, spun glass filter for compact bench installation. Pulls all dust from two grinder wheels.

For quick, economical, effective, dust control *at the source*, install DUSTKOPS. Easy to attach to surface grinders, disc grinders, cutter and tool grinders, flexible shaft grinders—or to buffers, sanders and abrasive cut-offs—whether single or multiple units. Large or small models available.

DUSTKOPS are compact and portable. Entirely self contained, with motor, fan, cyclone separator (in all but smallest models) and spun glass filter. Flexible metal hose permits quick installation.

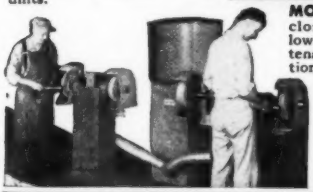
DUSTKOPS clean the dust-laden air without wasting heat. Efficient cyclone separator provides low maintenance. Many other features make DUSTKOPS ideal for your shop or laboratory. Immediate shipment of "standard" voltage units.





MODEL 950—has cyclone separator, plus spun glass filter. For medium duty work of all kinds.

MODEL 950—with cyclone separator means low first cost, low maintenance, even on production surface grinder.





(Left)
MODEL 1250—one unit handles dust from four wheels.

MODEL 1250—gets all dust and smoke from this heavy duty abrasive cut-off, at extremely low cost.

Write NOW for Bulletins

AGET-DETROIT COMPANY
605 First National Building — Ann Arbor, Michigan
Detroit Office: Tel. CAdillac 3090

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



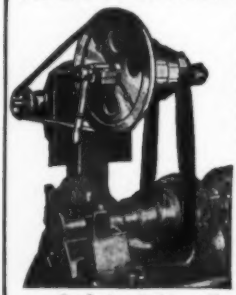
Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular

NIELSEN TOOL & DIE COMPANY
1962 W. Eleven Mile Road, Berkley, Mich.

STEEGE MOTOR DRIVES FOR DEFENSE GUARANTEED FOR FIVE YEARS

No chance of breakdown, doing a good job powering machines for defense production. No noise, floating cone, results 100% power. 8 years of production proof of durability. Easily installed.



PRICED AT $40. AND UP. FOR LATHES, SHAPERS, MILLERS, ETC. IMMEDIATE DELIVERY. *Send for descriptive pamphlet.*

W. L. STEEGE MACHINERY CO.
100 So. Jefferson St., Chicago, Ill.

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new TWISTITE Vise. Opens to full capacity in one second. Speed Defense Production with this New Vise.

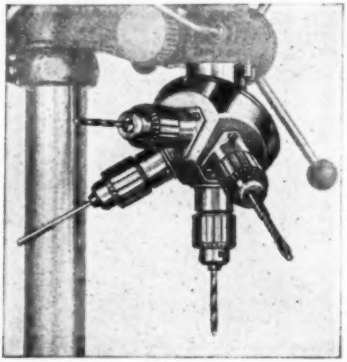


J. A. Richards Co., Kalamazoo, Mich.

DRILL TURRET ATTACHMENT

A new attachment for drill presses that is said to quadruple the capacity of any drill press is sold under the tradename Quadrill.

The manufacturer states the new unit is a precision built rotary device that holds four tools. The desired tool can be placed in work position by a "flick" of the finger, thus eliminating necessity of changing tools as in a single chuck drill press. It is claimed to do all the work of any drill press such as drilling, counterboring, reaming, center-drilling, countersinking, spot facing and other operations.



Yet, according to the manufacturer, because the Quadrill holds four tools it actually permits one drill press to do the work of four. Only the drill in working position rotates while the other three remain stationary. The entire unit is assembled to the quill of the drill press and is driven from the spindle.

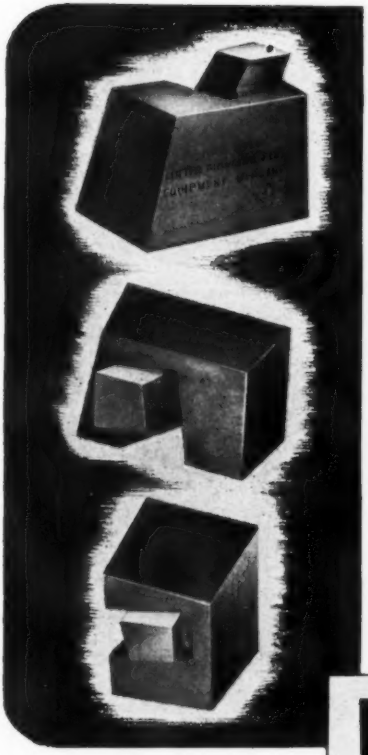
It is further asserted that because of its special construction, strict alignment and accuracy as true as the drill press itself are maintained.

Hardened friction starter and driver assure clash-free synchronization of the driver teeth. The four hardened and ground spindles are fitted for No. 32 Jacobs Chucks or their equivalent. Ball bearings are used in all spindle assemblies.

For complete details write, Chicago Drillet Corp., 919 N. Michigan Ave., Chicago 11, Ill.

Free Those SKILLED HANDS





With The

BOX MILL CUTTER GRINDING FIXTURE

You no longer need to use a skilled grinder hand to keep your cutting tools in good order. This new fixture will enable an apprentice to grind BOX MILL CUTTERS with complete uniformity and absolute accuracy.

All angles on the cutters are predetermined by the hardened and ground sides of the grinding fixture thus assuring you a minimum of grinding and no repetition of work to correct errors.

It not only enables you to grind cutters faster but gives more grinds per tool bit.

PRICE . . . $32.50

This fixture is intended for Warner & Swasey and Gisholt Single Cutter Turners up to 1" x 1¼" shank in both High-Speed and Carbide Tipped Tools.

WRITE FOR FURTHER PARTICULARS

EQUIPMENT MFG. INC.

8640 GRINNELL AVENUE
DETROIT 13, MICHIGAN

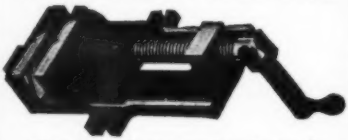
SMALL SHANK CUTTERS

For plants that require especially fine finishing of castings, patterns and parts, Severance Tool Industries, Inc., Saginaw, Mich., has recently announced ideal tools —Midget Milling Cutters with ⅛" shanks. Hardened, then ground from the solid, these, efficient long wearing little tools have all the same characteristics of the larger ¼" shank tools in the Severance line. They cut sharp chips from hard metal, wood or plastic. Because of their small size, they are practical for finishing intricate patterns and parts. These



new ⅛" shank Severance Midget Milling Cutters are available in 10 standard shapes —singly and in sets of 10 in a convenient kit box. While Severance has furnished ⅛" shanks for a number of years on special order, this is the first time this feature has been offered as a standard item.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

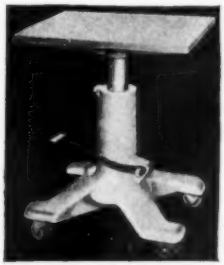
NEW CALIPER
SPEEDS UP DEFENSE WORK

Direct Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures to 4 inch.



FREE LITERATURE and PRICE on request

T & H MFG. CO.
811-P. East 31st, K.C., Mo.



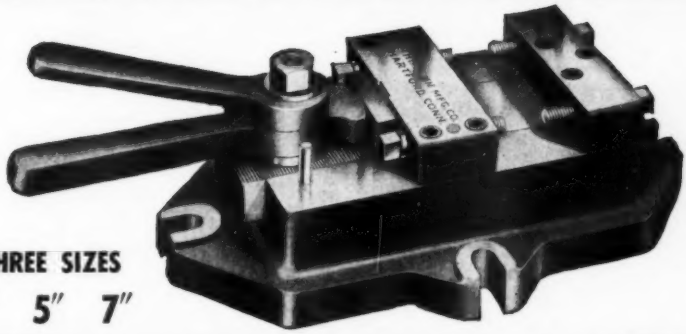
SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

NOW NATIONALLY DISTRIBUTED THROUGH LEADING SUPPLY HOUSES



THREE SIZES

4″ 5″ 7″

FENN QUICK-ACTION VISE

A partial list of suppliers who are prepared to give you special service. If your territory is not listed write direct.

Dillon Supply Company
Raleigh, North Carolina

The Globe Machinery & Supply Co.
Des Moines, Iowa

The Hardware & Supply Company
Akron, Ohio

The Jennison Hardware Company
Bay City, Michigan

Kasper & Koetzle, Inc.
Brooklyn 6, New York

Langdon Supply Company
Kansas City 7, Missouri

Lewis Supply Company
Memphis, Tennessee

The C. S. Mersick & Company
New Haven 7, Conn.

Mill & Factory Supply Co.
Toledo, Ohio

C. T. Patterson Company, Inc.
New Orleans 7, Louisiana

Peden Iron & Steel Company
Houston 1, Texas

Henry A. Petter Supply Company
Paducah, Kentucky

Root, Neal & Company
Buffalo, New York

The South Bend Supply Company
South Bend 24, Indiana

Strong, Carlisle & Hammond Co.
Cleveland 13, Ohio

Theo. C. Ulmer, Inc.
Philadelphia 25, Pennsylvania

The Vonnegut Hardware Company
Indianapolis 9, Indiana

The Henry Walke Company
Norfolk 1, Virginia

CANADA

Northwest Industries Limited
Edmonton, Alberta

Rudel Machinery Co., Limited
Montreal - Toronto - Windsor

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

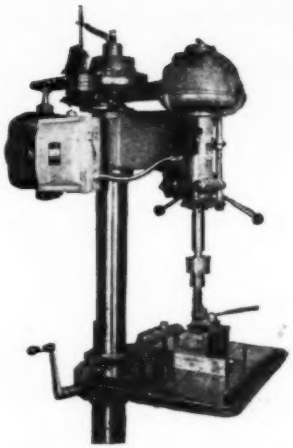
THREAD-ALL TAPPER

A new Thread-All Tapper is announced by the Gruen Gauge Co., 10039 Marcus Ave., Detroit, Mich. The device is easily installed on any drill press, converting it into a precision tapping machine.

It is emphasized that because of the controlled action of the spindle, very small taps can be handled without fear of breakage. On the other hand, the units at present available will also drive taps up to 1½" in size.

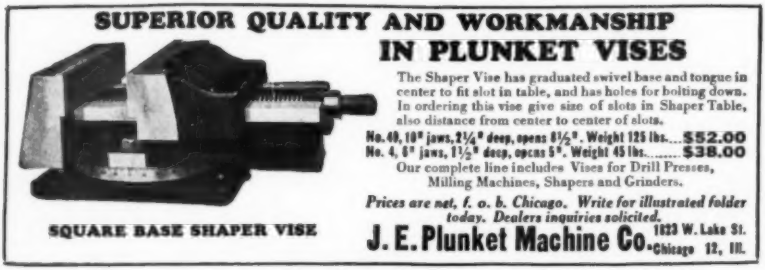
Here are some of the features emphasized by the manufacturer:—The device is designed to handle precision tapping without need of lead screws. Depth setting is electro-magnetically controlled and positive. No adjustments are necessary for tap size. Motors run at constant speed and are not affected by the tap size. Silent forward drive is provided along with automatic high speed reverse action. Either right or left hand threads may be tapped without adjustment. The device takes up no working space; threading as well as tapping may be handled and the machines may be used for drilling, reaming, counterboring, etc., without adjustment.

It's asserted that some of these units have already tapped over a million parts for Army and Navy aircraft (Class 3 and finer fits) without a breakdown or even an adjustment, and have been in operation continually on 24 hour shifts.









ARTUS ARBOR SPACERS

The COLOR tells the THICKNESS

ARTUS ARBOR SPACERS U. S. PAT.

ARTUS Arbor Spacers made of plastic in various colors identify thickness at a glance! .001, .0015, .002, .003, .005, .0075, .010-.030. Speed up accurate fitting at low cost. Write for folder.

CONVENIENT TRIAL OFFER

Handy Spacer Assortment

10 ea. .001 — .0125 thick
5 ea. .015 — .030 thick

100 SPACERS IN ALL

⅞" — $2.80 1¼" — $3.40
1" — 3.00 1½" — 4.20

Other standard sizes also available.

Illustrated Folder Free.
Immediate Delivery on Spacers, Gaskets, Shims

INDUSTRIAL PRODUCTS SUPPLIERS
6 Broadway New York 4, N. Y.



EXTRA LARGE COLLET CHUCKS

•

Up to 2¾" Capacity

•

Readily adaptable to machines of all sizes and makes — lathes, screw machines and grinders—and for any operation requiring a chuck.

IMMEDIATE DELIVERY!

Write for Literature!

Territories Open for Representatives

UNITED INDUSTRIES
15830 Livernois Detroit 21, Mich.

18 WAYS TO SAVE TIME & MONEY *with the* MEAD *Industrial Burring Machine*

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money — also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time"—install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.



MEAD
Specialties Co.
15 S. MARKET
Dept. 104-Y
CHICAGO 6, ILL.

For METAL - PLASTIC - WOOD

"DUSTEX" COLLECTOR



Manufactured in four sizes, the Dustex portable dust collector is designed to meet need for an efficient and economical means of removing from the air, dangerous and obnoxious dusts arising from industrial operations. It is built by the Dust Filter Co., 4418 N. Clark St., Chicago 40, Ill.

The principle underlying the unit is compound action on air borne dust, first by centrifugal separation from the air stream and second, by impingement on the filter surface. Maintains constant static air suction of more than 4" at velocity of over 5000 IFM. Completely fireproof, units weigh from 75 to 200 lbs. and are 30 to 51" high.

Filter assembly consists of two corrugated layers of wire mesh covered with 60-mesh filter cloth. Filtered air is discharged thru muffler to deaden air noise but with a minimum resistance back into room.

REX PUMPS

Bulletin No. 447, descriptive of Rex Speed Prime Pumps has been issued by Chain Belt Co., 1600 W. Bruce St., Milwaukee 4, Wis.

These pumps are general purpose self-priming centrifugal pumps designed to fit a wide range of pumping needs. They can be applied to many types of pumping work because of their compactness, efficient operation, and positive self-priming feature.

"STAR DUST"
LABORATORY GRADED
PURE DIAMOND POWDERS

Precision LAPPING POWDERS
for PRECISION Work.
GAUGES — TOOLS — DIES — Etc.
with tremendous saving of time.

These are the factors which make STAR DUST indispensable in lapping and superfinishing operations on HARD STEELS, TUNGSTEN CARBIDE and Chrome.

- Absolute control of particle sizes
- Complete absence of out-size particles
- STAR DUST sizes as fine as .0001"
- Complete range of grit sizes



STAR DUST speeds up production enormously and produces finishes and super-finishes down to less than .0000004 of an inch.

Consult us about your lapping and super-finishing problems.

ACE ABRASIVE LABORATORIES
ONE SPRUCE STREET
NEW YORK 7, N. Y.

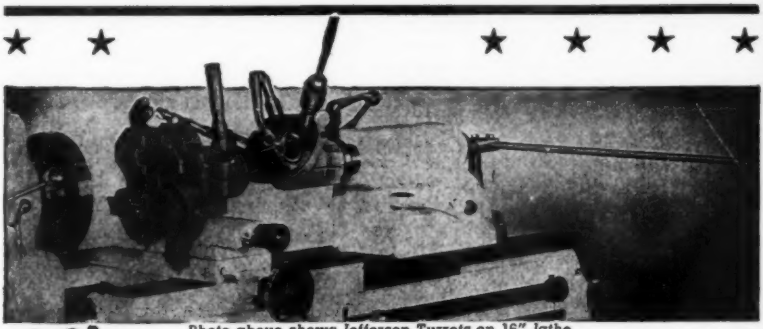


Photo above shows Jefferson Turrets on 16" lathe



7½" Swivel Base Dividing Head — In Stock
IMMEDIATE DELIVERY
No Priority Required

Convert

YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS



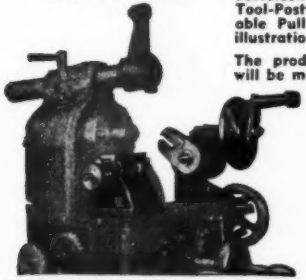
5-Tool Tail-Stock Turret

PAT. PENDING

Yes, it's as easy as that! You simply attach the Jefferson Tail-Stock Turret, the Jefferson Tool-Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in illustration.

The productive capacity of these machines will be more than doubled in many instances because there will be available at all times NINE DIFFERENT TOOLS.

With these three JEFFERSON time-saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc., without stopping the lathe, or changing tools. THE JEFFERSON TURRETS are made very substantial, rigid, accurate and in several sizes to fit small bench lathes up to 24" swing.



6" Tilting Dividing Head with 3 Indexing Plates and Tailstock—
Immediate Delivery.
Also immediate delivery
Plain Dividing Head.



4-Tool Tool-Post Turret

Jefferson Turrets are real production tools—substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market.

Some territories still open for dealers and salesmen.

TURRET DELIVERIES IN 6 DAYS

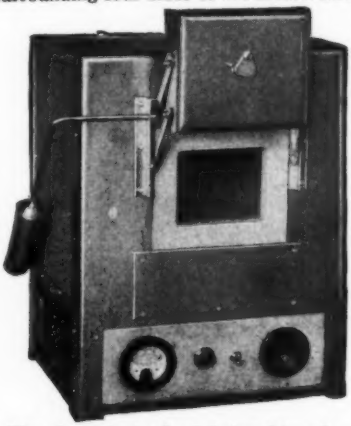
JEFFERSON MACHINE TOOL CO.
700 W. Fourth St., Cincinnati 3, Ohio

Tool-Post Turrets, Tail-Stock Turrets, Adjustable Pull Feeds, Belt Sanders, Gyratory Foundry Riddles, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vises.

THERMO ELECTRIC FURNACE

A new electric furnace, providing temperatures up to 1850° F and incorporating several unusual features of design, has been announced by the Thermo Electric Mfg. Co., 486 W. Locust St., Dubuque, Ia. Known as model OFE, this furnace will find wide application for heat-treating tools and dies in machine shops, and for other general industrial and laboratory use.

The front is formed of heavy steel plate, rounded at corners, and has an instrument panel built into base. Construction features a heavy steel, welded frame, with transite sides, and with 4¾" of insulation around heating chamber. Heating element is of high quality nickel chromium alloy in coiled form, completely surrounding four sides of the muffle core.



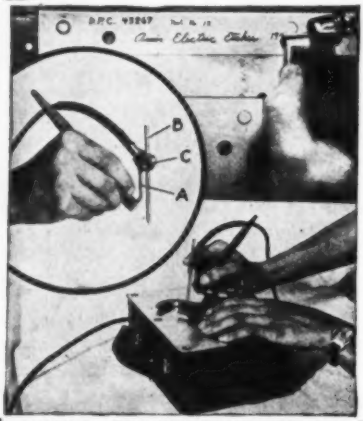
The door, instead of being hinged at bottom or suspended on a cable, is supported by two sets of parallel levers, so that when opened it moves upward and out of the way. It is heavily insulated and operates easily.

Close heat selection is provided by an input controller, mounted on instrument panel, which automatically turns current "on" and "off" for any desired portion of a one minute cycle. No external rheostat is required, and since the entire power is consumed within heating chamber, maximum efficiency is achieved. Instrument panel also includes an indicating pyrometer calibrated to 2000° F, a pilot light to indicate operation, and an "on" and "off" switch.

Measurements are—21" wide, 31" high, and 18" deep; heating chamber itself is 5½" wide, 4½" high, and 10-1/2" deep. It is built for operation on either 115 or 230 volts, and is rated at 2000 watts.

MEEHANITE BULLETIN

A 4-page Bulletin No. 20 entitled "Meehanite—The Metal for Wear Resisting Castings" has been published by the Meehanite Research Institute of America, Inc., Pershing Square Bldg., New Rochelle, N. Y. It illustrates and describes the various types of Meehanite which are manufactured for wear resisting applications.



ANNIS ELECTRIC ETCHERS

(for precision work)

with the stylus that stays cool

R. B. ANNIS CO.

INDIANAPOLIS 2, IND.

Gusher

COOLANT PUMPS

Write for descriptive literature

Made in various types and sizes from 1/30 to 2 H.P. Pumping capacity up to 200 g. p. m. Many patented and exclusive features.

THE RUTHMAN MACHINERY CO.

1808 Reading Rd. Cincinnati, Ohio

No. 103
HEAVY
DUTY



Bridgeport
VERTICAL
SURFACE GRINDER
Smooth Hydraulic Operation

Produces flat surfaces with precision accuracy and rapid stock removal. Large table capacity and many other mechanical advantages have been designed into this improved grinder. Write for complete details.

CATALOG ON REQUEST.

THE BRIDGEPORT
SAFETY EMERY WHEEL CO., Inc.
BRIDGEPORT, CONN., U. S. A.

HERE'S YOUR ANSWER.



RIEGER MULTIFACER

Change the insert bit in the Multifacer and you change the cut. Simply insert the right bit and you can spot face, counterbore, seat, or cut annular rings of the diameter and contour you want. Bits can be changed without tearing down the job. Multifacer is tough alloy steel properly heat treated and ground. Made in three sizes for cuts of 1" to 5" diameter. Pilot bushings available for different sized holes. Get all the facts about this tool of many uses.

Write for literature now.

THE RIEGER MFG. CO.

DEPT. MT-10 MIAMISBURG, OHIO

REPRESENTATIVES:
Harry E. Hummer, 115 Montclair Ave., Newark 4, N. J.;
Jack Brewer, 1151 S. Broadway, Los Angeles 15, Calif.

IMMEDIATE DELIVERY

3,000 New Steel Stacking Boxes



Illustration Shows boxes Stacked 3 High

Well constructed

$2.00 each, F.O.B. Chicago

24"x15"x7½—18 gauge. Drop handles both ends. Lots of 25 or more.

PASSMAN BROTHERS

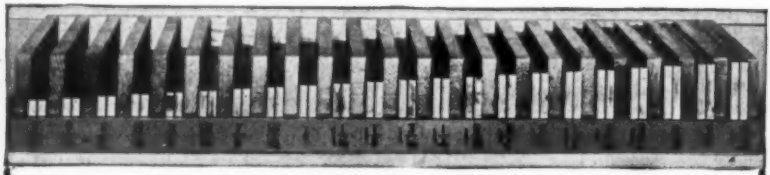
1101 W. Lake St. Chicago 7, Ill.

ROTOREX TAPPING ATTACHMENT

In addition to their line of Precision Tool Room Grinders, Millers, and Slotters, Douglas Machinery Co., Inc. 150 Broadway, New York 7, N. Y., offers a new Precision Tapping Attachment developed thru its associates, The Hunter Engineering Co., Riverside, Cal.

The attachment is unique, in that it provides controlled positive lead tapping, and an automatic cycle in a low priced attachment which may be readily installed without any alteration on a standard 17" Delta Drill Press. The controlled lead principle makes it possible for unskilled operators to consistently produce Class 3 or better threads.

Lead screw is hardened and ground, has a large bearing surface, is well protected against chips and dirt, and is adequately lubricated. The large diameter screw is mounted as close as possible to the chuck to eliminate errors in lead, which may be introduced by torque or wind-up effect of the spindle under heavy load. Lead screws and meeting nuts are available in pitches from 11 to 72 threads per inch. An attractive new bulletin gives full details.



Attention: Tool Supervisor **Compare Price and Accuracy**

ANTON STEEL PARALLELS

Hardened and Ground

Width ¼"	Length 6"	
Accuracy	Within .0001" in Parallelism and Straightness over entire length of 6", equal to about 17 Millionths per inch.	Sold to consumers only
Depth of Hardness	About .040"	
Hardness	Rockwell C 64 ± 4	

COMPLETE SET OF 22 PAIRS from ½" to 1-13/16" in height in steps of 1/16", with case, as illustrated, $85.—net, F. O. B. New York, N. Y.

Sold in complete sets only and ON MONEY BACK GUARANTEE

THE MOST IDEAL SET OF PARALLELS WHICH SHOULD BE IN EVERY TOOLROOM AND INSPECTION DEPARTMENT

IMMEDIATE DELIVERY ON HIGH PRIORITY

EASTERN MACHINE AND TOOL COMPANY

170 Broadway Tel. COrtlandt 7-3579 New York 7, N. Y.

PRODUCTIMETERS
accurate
speedy
counters



for production machines

You have to know what your machines are doing . . . and know it instantly! Whether it's the number of pieces or parts produced . . . strokes or revolutions . . . feet or yards . . . cartons or cases. . . Such information is vital for keeping up schedules . . . for proper maintenance and servicing of machines. Productimeters automatically, dependably give you the right answers.

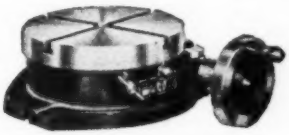
Illustrated: Rugged, high-speed Stroke Model 5-H-1-1-R.

Bulletin No. 100—a concise, ready reference catalog of 100 standard models — sent at your request.

DURANT MANUFACTURING COMPANY

1928 N. Buffum St., Milwaukee 1, Wis. • 180 Eddy St., Providence 3, R. I.

BRAND NEW PRECISION ROTARY TABLES



9" — $ 97.00
12" — 160.00
15" — 185.00
18" — 220.00

OUR ROTARY TABLE WILL TAKE THE PLACE OF A COSTLY FIXTURE. IT IS USED FOR ALL KINDS OF WORK ON MILLING MACHINES, SHAPERS, DRILL PRESSES AND HORIZONTAL BORING MILLS.

WE CAN ALSO FURNISH DIVIDING ATTACHMENTS.

SEND FOR LITERATURE AND DETAILS.

FAST DELIVERY GUARANTEED.

Send for Literature of other tools.

LAFAYETTE TOOL & SUPPLY CO.

128 LAFAYETTE ST. NEW YORK, N. Y.

FINE PITCH PRECISION GEARS

MANUFACTURERS OF:
SPUR GEARS
HELICAL GEARS
INTERNAL GEARS
SEGMENTS
SPLINES
SHAPED PARTS

MICRO PRECISION
FINE PITCH GEARS

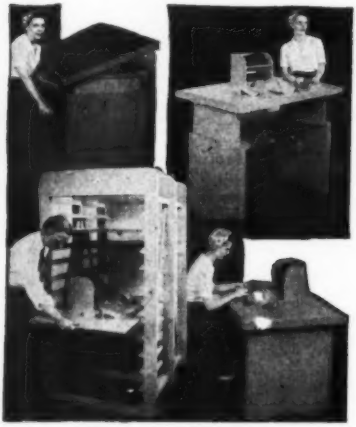
RANGE OF DIAMETERS: FROM ¼" TO 7" ON EXTERNAL GEARS, FROM ½" TO 6" ON INTERNAL GEARS; FACE WIDTH FROM 1/32" TO 2"; PITCH RANGES FROM 6 TO 240 PITCH.

SEND B/P FOR QUOTATION—PROMPT DELIVERIES

MICRO PRECISION GEAR & MACHINE CO. 1712-14 CHESTER AVE. CLEVELAND 14, OHIO

RIGHTOP WORK TABLE

It raises, it tilts, it has interchangeable tops. Together with holding rack, this new Rightop Work Table keeps up to 12 jobs "on the board" at one time.



Top is removable; simply lifts off and slides into rack until it is needed again. Nothing in work on the top need be displaced. Interchange tops and work on one job and then another, without disturbing any one job. Twelve tops, areas to suit, and you have the equivalent of a dozen work tables for any one operator.

Adjustable as to height by simply turning crank, the Table is always just the right height for operator, sitting or standing, minimizing fatigue. Tip the top and you get angle the operator wants.

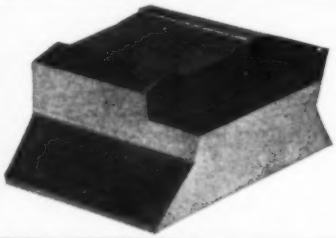
For small assembly, for all work within its area, there are scores of jobs in many shops where the Rightop Work Table wiil be a new convenience and a practical time saver.

The Table and Rack are distributed by Voss Machinery Co., 2808C W. Liberty Ave., Pittsburgh 16, Pa.

RAPID FINISHING STEEL

A new 4-page bulletin presents helpful information on Jessop rapid finishing tool steel. Its characteristics are described briefly, along with a list of typical applications. Helpful working data is given on forging, annealing and hardening and a chart shows the tempering range.

Copies are available from Jessop Steel Co., Washington, Pa.



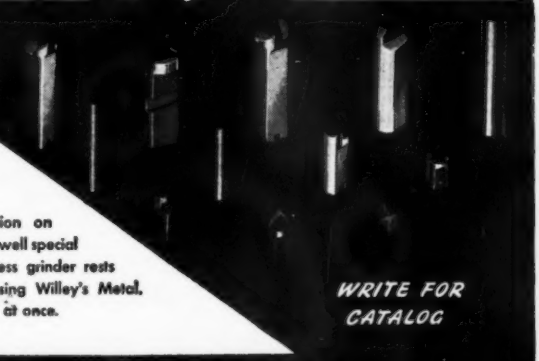
FORM-GROUND CARBIDE TOOLS

Special Carbide Reamers Made to Order

C. F. SCHMARJE CO.
MUSCATINE, IOWA

WILLEY'S

TUNGSTEN CARBIDE TOOLS



● Standard tools carried in stock for immediate delivery. Special tools built to your specifications.

Catalog gives full information on standard tools and blanks, as well special tools, gages, centers, centerless grinder rests and other special articles using Willey's Metal. Get your copy of Catalog 27 at once.

WRITE FOR CATALOG

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway — Detroit 1, Michigan



WHEN CIVILIAN PRODUCTION GETS THE GREEN LIGHT

GAUGES, DIES, JIGS, FIXTURES

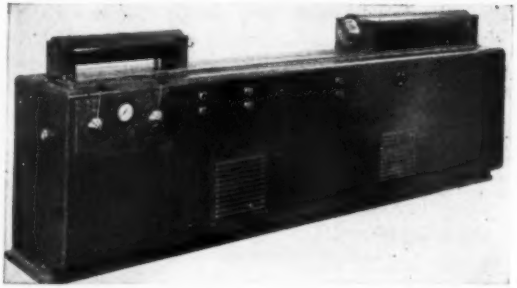
MASTER GAUGE will be Ready!

Immediate or prompt delivery on THREAD PLUG GAUGES

MASTER GAUGE CO.

2210 FENKELL AVE. Phone: University 3-7676 DETROIT 21, MICH.

BARNES 7½-TON DRAWING MACHINE



A 7½ ton hydraulic cold drawing machine is one of the many recent developments of the John S. Barnes Corp., Rockford, Ill. The novel operating features of this machine are typical of the features offered by a Barnes engineered hydraulic system.

Drawing die is mounted centrally on working table and supports work piece. When work is set-up, machine cycle is started by depressing the two "forward" push buttons simultaneously. A small cylinder ram at left traverses forward and stops behind die. Then the large ram moves forward forcing work thru the die. Drawn piece upon leaving die is steadied by small ram. Thus the large ram moves forward, exerting a differential load of five tons upon the work. When the drawing operation is completed, the "return" push buttons are depressed causing large ram to return to starting position. The dual push button control system requires use of both hands in operating machine thus eliminating all danger to operator.

Dial pressure gauge on left front face of machine clearly indicates die loading thruout drawing cycle. The two adjacent control handles operate speed control valves which permit variable traverse rates up to 240" per minute. Hydraulic structures are unit-mounted within left end of machine base whereas the electrical control panel is located at opposite end of base. All equipment is readilly accessible for servicing by removal of sheet metal covers.

G-M MODEL NO. 1130

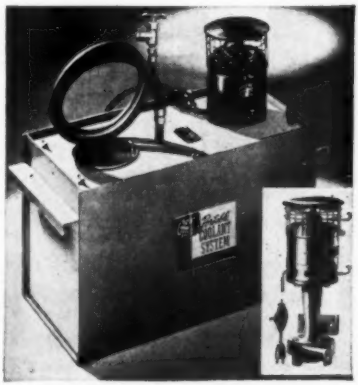
A new model in the Gray-Mills line is particularly suited for application of coolants to grinders, cut-off saws, milling machines, and such operations as fine abrasive cutting and honing. Called Model 1130, the new system is designed to suit requirements which do not need the greater capacity of a Model 1000 Centrifugal System. Flow is adjustable from a trickle to a full stream.

The unit is simple, compact, sturdy, and easily portable. Engineered to fit industry's needs, it is ready for immediate plug-in operation and fits snugly under a machine or in any out-of-the-way place. Little maintenance is necessary—lubrication points are readily accessible. Forced-settling baffle plates are built into tank to reduce circulation of solids.

Heart of the 1130 is the new Gray-Mills 100 Centrifugal Pump with a capacity of 1200 gph (water) at 0 head; 360 gph at 5 ft head. Motor is of 1/15 hp with sealed bearings.

The Pump is also designed for in-built coolant systems and as a general purpose pump for sumps, etc. Mounting bracket permits either vertical or horizontal attachment, or unit may rest on its base of 3 legs. Abrasives or chips pass thru pump without binding or abrading; thus wear is negligible. Motor cannot be overloaded when discharge is cut down or stopped.

Complete details and specifications are available from Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill.



Put Them To Any Test —
Right In Your Own Plant . . .

HERMAN

Precision Granite

SURFACE PLATES



Patent Pending

Discover for yourself the advantages of HERMAN *Precision Granite* SURFACE PLATES — advantages that have made them the preference of scores of important plants engaged in important war work. We'll send you a sample plate, on approval, to be tested in your own plant. HERMAN *Precision Granite* SURFACE PLATES are positively accurate to .0001 overall; they're hard, smooth, warp-proof, non-magnetic, non-corrosive. Available in many sizes at reasonable prices.

Write today for descriptive folder, technical data, and a sample for test in your plant.

A Few Typical Users of Herman Granite Surface Plates

U. S. Bureau of Standards
General Motors
Chrysler Motors
Ford
General Electric
Westinghouse Electric
Allis-Chalmers
International Harvester
Curtiss-Wright
Crosley Radio
Bendix
Bausch & Lomb

The Herman Stone Co.

1238 Leonhard Street, Dayton 4, Ohio

"World's Finest Precision Ground Universal Joints"



DIX

PRECISION-MADE and AVIATION TYPE

Wherever perfect-functioning joints are required — Dix Precision-Made Universal Joints will give the utmost performance and satisfaction. Let Dix engineers help solve your problems.

DIX Universal Joints come in 15 standard sizes, from ⅜" to 4" Hub Diameter made to Army, Navy, Air Corps spec. AN-40236 ready to install, or can be made to customer's specifications. Eliminate "rejects" with DIX Universal Joints! Write, wire for catalog, prices, specifications, etc.

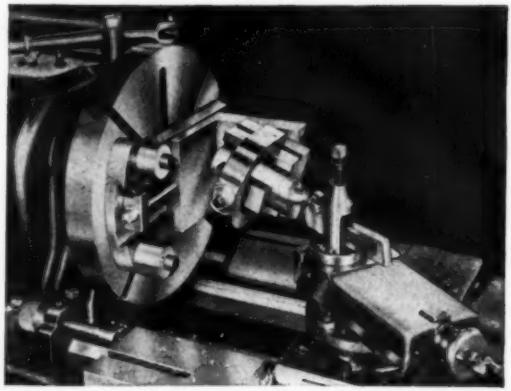
DISTRIBUTORS TERRITORY STILL OPEN JOBBERS

DIX MANUFACTURING COMPANY

3447 EAST PICO BLVD. LOS ANGELES 23, CALIF.

PRECISION MADE PRODUCTS

BEST TOOLS OFFERS LATHE ANGLE PLATE



A New Lathe Angle Plate with accessories, manufactured and sold by Best Tools Corp., 482 Sunrise Highway, Rockville Centre, Long Island, N. Y., accomplishes many unusual operations on any standard make lathe, and eliminates need of many costly special jigs and fixtures usually needed to machine intricate jobs on a lathe.

Known as No. 51, this attachment is designed for use on any 14 to 16" swing lathe. It is positioned by a locating nose in head stock spindle, and is then bolted to face plate. It is equipped with an adjusting screw and the necessary gages so that by the use of size blocks or calipers work may be located with a high degree of accuracy. The angle plate itself can be lowered to about 5¼" off center.

Precision machined, No. 51 is readily set up on lathe face plate, and without special jigs and fixtures it is possible to do any of a number of specialized machine shop jobs that are frequently required in making samples or in short or long production runs.

These include offset radius turning, cutting eccentrics, angle boring, turning compound angles, (as in the illustration) and other operations that are not ordinarily considered as straight lathe work. It is especially adapted to jig and fixture work where holes, straight or directional, must be held and spaced to close tolerances. The great advantage of the Plate and its accessories is the enlarged scope of work that can be handled simply and easily on an ordinary lathe. This attachment converts the lathe into a miniature boring mill.

The several accessories are clamps to hold various shapes of stock. The clamping accessory regularly furnished is a straight adjustable clamping saddle suited to hold straight stock. As standard equipment, a square clamp is furnished permitting the handling of cubes up to 5x5x5".

No. 51-A, first of the optional use accessories is a multi-use unit that permits such work as offset angle boring and turning, boring turret heads, etc.

No. 51-B, (illustrated) permits turning a compound angle an a piece of round stock. It is fastened to lathe face plate by means of the basic face plate attachment and angle. Round stock up to 2½" in diameter can be handled.

No. 51-C, is a work holder accessory especially valuable for holding die plates, for line boring of holes to close tolerances. With it, shapes of virtually any description can be drilled and finish-bored out of solid stock. Plates up to 5x10x1" may be handled.

BRIGGS CLARIFIERS

The Briggs Clarifier Co., Wisconsin at "O" St., N. W. Washington, D. C., announces addition of a new series to its standard line. Known as ZR Series, these Clarifiers are designed for continuous filtration of soluble oils, low viscosity cutting oils and kerosene used in precision grinding, honing, light broaching, milling and lathe work.

Because of its ability to maintain the properly selected coolants in optimum condition, the ZR Series is said to have established its value both in dollar returns and in producing better work. Grinders and honers equipped with this coolant filter are claimed to maintain accuracy in size with tolerance as low as .00002" and surface roughness (finish) to as low as 3 micro inches.

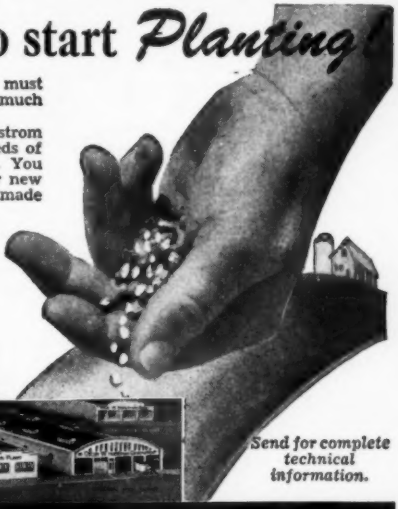
Ratings are based on 3 GPM flow thru each refill in order to obtain a useful refill life of 100 to 150 hours. The ZR Series Filters can be installed on either unit machines or in central systems. Size of the filter depends on the actual flow rate of the coolant.

Now is the time to start *Planting!*

and any seed for healthy post-war growth must include the new elements that contributed so much to victory.

OH-38 Aluminum Alloy—an exclusive Hedstrom product—has proven its superiority in hundreds of war products and permissible civilian items. You will want it for the component parts of your new and improved products—for parts that can be made better, faster, cheaper—with OH-38.

OH-38 is used only in castings by Hedstrom.



HEDSTROM

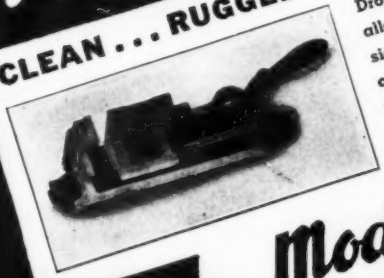


Send for complete technical information.

OSCAR W. HEDSTROM CORP. 4830 West Division St., Phone Columbus 3667, Chicago, 51, Ill.

a Cam Vise that is . . .

CLEAN . . . RUGGED . . . QUICK IN ACTION

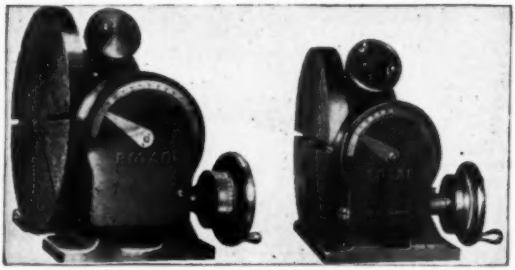


Drop forged cam parts; hardened alloy steel screw and handle. Precision built for rapid production work on milling machines. Hardened and ground jaws. Semi-steel castings throughout. Square key slots in base at right angles.

Modern Tools

BERLIN, CONNECTICUT

ADDITIONS TO ROTAB LINE



Two new sizes—a 12" and a 24" Rotab — have been developed by the manufacturers, Machine Products Corp., 6767 E. McNichols Rd., Detroit 12, to broaden the scope of applications of this device. It is claimed they bring greater efficiency and increased savings in production time to milling and boring operations where machining or checking of unusual angles must be performed.

The compact design of the 12" model is particularly adapted to milling operations and lends itself to easy mounting on the table of a milling machine. Despite its diminished size, this model provides all the rigidity necessary to withstand any machining operations that would normally be required.

Like the original Rotabs (36"), this small model has a rotating table to which work is clamped. The table can be turned to any degree and can be made to assume any position radially in addition to permitting its plane to be fixed to any angle from vertical to horizontal. As it may also be fixed in a position 30 degrees in the opposite direction without disturbing initial clamping of work, use of the Rotab effects considerable time savings in reclamping and resetting when new positioning of the same work is necessary. Greater accuracy in machining is also achieved, it is claimed. The 12" model weighs 125 lbs.

The 24" model can be adapted to a wide range of milling and boring operations. Its weight is listed at 688 lbs.

Both models have dials showing degree and minute graduations which register angle of setting. An adjustable degree ring is under the face plate to avoid excessive turning of handwheel to obtain zero setting. A sine bar is furnished to provide greater accuracy on angular settings. The tables, which are hand scraped, may be locked at any desired position—radial or angular—and can also be disengaged to rotate freely by hand.

OIL POWER FLUID MOTORS

An attractive new 8-page bulletin has been issued by Sundstrand Machine Tool Co., 2535 11th St., Rockford, Ill. Devoted to oil power fluid motors offered by the Pump Division of this company, the bulletin describes and illustrates the operating principles, features, possible applications and engineering data of Sundstrand fluid motors.

Detailed diagrams are given of the different types and several typical uses are shown.

SCHERR BINOCULAR MICROSCOPE

Bulletin by George Scherr introduces their Model 25 Spencer Binocular Microscope for finish control. Features include vertical prism body, horseshoe base, inclination joint, triple revolving nosepiece and understage mirror. Copies are available from George Scherr Co., Inc., 122 Lafayette St., New York 13, N. Y.



QUICK ACTION CLAMPS

A complete line of five widths: 2" to 7".
An unlimited variety of lengths.
Sturdy — Handy — Durable.
High grade Steel and Malleable Iron.
Acme Thread Spindle.
For Welding jobs: Special type with spatter-proof spindles.

THE WETZLER CLAMP CO.
43-15-11TH STREET, LONG ISLAND CITY 1, N. Y.

WORN GAGES NEED BUILDING UP!

WITH DURO-CHROME*

*HARD CHROME TREATMENT

SEND FOR BOOKLET 557 WAYS DURO-CHROME SAVES MONEY

DON'T SCRAP WORN GAGES! Hard-surface and build them up with super-hard DURO-CHROME, before it's too late! SAVE worn or over-machined PARTS the same way.

America's pioneer industrial Chrome Treatment Plant treats machine parts and tools, day and night, for Chicago area's great War Plants.

SEELEY 8262 DURO-CHROME 25 S. HOYNE AVE. CHICAGO 12, ILL.

III CHICAGO, INC.

"ADJUST-ANGLE" KNURL HOLDER

Many patterns using only straight knurls





By adjusting the angle of the knurls, it is possible to produce a variety of straight, spiral and checkered patterns using only straight knurls. Capacity up to 2½" dia. of work. Special passing-over-stock design available.

Request Illustrated Price Circular

GRAHAM MFG. CO.

57 Bridge St., East Greenwich, R. I.

IMMEDIATE DELIVERY

Newfield UNIVERSAL FLY CUTTER

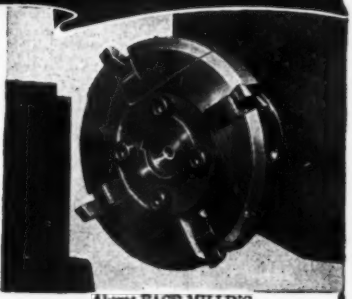
FOR SLOTTING — FLY CUTTING FLAT SURFACES—GEAR CUTTING STRADDLE MILLING — ETC.

A single Newfield Universal Fly Cutter, utilizing any type of standard high speed steel or carbide bits, makes multiple cuts in one operation. Fits all standard arbors, turns to any required speed for fly cutting, slotting, surface and straddle milling, gear cutting, disc and gasket cutting.

SPECIFICATIONS OF UNIVERSAL FLY CUTTER

Size	Bore	Bit Size	Width	No. of bits	Prices
4"	1"	¼"	5/16"	4	$44.75
6"	1½"	¼"	1"	4	49.75
8"	1¼" or 1½"	3/8" or ½"	1"	4	59.75
10"	1½"	½"	1"	6	79.75

Above prices F.O.B. Los Angeles



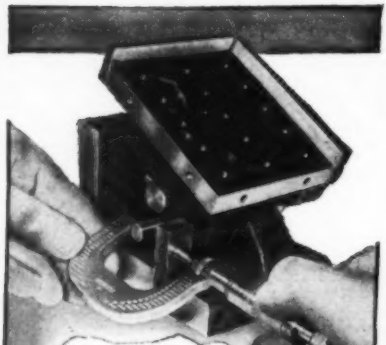
Above: FACE MILLING

Individually adjustable rotating bit holders permit slots of any shape to be cut from 3/16" to 1½" wide.

MARSHALL TOOL & SUPPLY CO.

1224 SANTA FE AVENUE • LOS ANGELES 21, CALIFORNIA

*Send for our latest 80-page catalog showing new time-saving tools for machine shops and aircraft industries.



ANGLES

"TO A MINUTE IN A MINUTE!"

THE BEMISINE

SPEEDS UP AND SIMPLIFIES SETTING ANY ANGLE FROM 0 TO 90° — USING ONLY A 2" MICROMETER! * IT HOLDS THE WORK! FASTER THAN A SINE BAR OR PROTRACTOR! CONVERTS SET-UP TIME TO PRODUCTION TIME ON SURFACE GRINDERS, JIG BORERS & MILLERS.

* ALSO USED WITH STANDARD GAGE BLOCKS

Assuring

UNIFORM RESULTS IN HEAT TREAT PRODUCTION



U. S. Patent Re-issue No. 22,533

● The NIAGARA Aero HEAT EXCHANGER constantly maintains correct quench temperature, cooling or heating, as determined by the rate of heat input or load fluctuations. This is accomplished by the Niagara patented "Balanced Wet Bulb" control which automatically uses the correct mixture of fresh outdoor air with air re-circulated. The NIAGARA Aero HEAT EXCHANGER employs the evaporative principle of cooling, eliminating costly water bills and protecting the user from the risk of interrupted water supply. Its direct savings quickly repay for its installation. Write for Bulletins 90 and 96.

NIAGARA BLOWER COMPANY

Over 30 Years of Service in Industrial Air Engineering

Dept. MT-104, 6 E. 45th St., N. Y., 17, N. Y.

Field Engineering Offices in Principal Cities

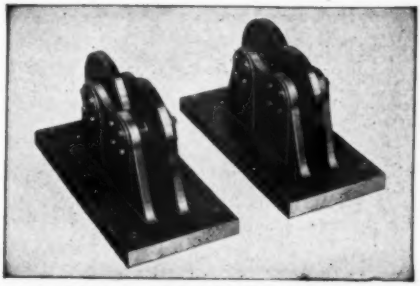
NIAGARA

AIR ENGINEERING EQUIPMENT

PILLOW BLOCK BALANCING WAYS

Especially suited for large diameter work, as a sub-base can be made of proper height to give necessary clearance for work.

Anderson Pillow Block Balancing Ways are precision built with chilled iron discs which rotate with minimum friction on sensitive special bearings. Many manufacturers have endorsed them for profitable, efficient, static balancing.



Built in 1000, 2000, 5000, 10,000 and 20,000 Capacities

Back the Attack
BUY BONDS

ANDERSON BROS. MFG. CO.
Anderson
ROCKFORD, ILL. U.S.A.

Write for
BULLETIN 105

C-F POSITIONERS

Handle the BIG JOBS *Easily & Safely*

With C-F Positioners each welder can position even the most cumbersome weldments with a push button control — without crane work or handling crews. He can rotate the weldment a full 360°, rotate it at any speed from 0 R.P.M. up and can tilt it to 135° beyond horizontal . . . can weld all sides, surfaces and angles downhand with a single set-up; with larger rods and fewer passes. All C-F Positioners, both stationary and portable, are pedestal mounted to give maximum clearance; all are adjustable for height.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.
1321 S. Kilbourn Ave.
Chicago 23, Ill.



STANDARD TEBO GAGES

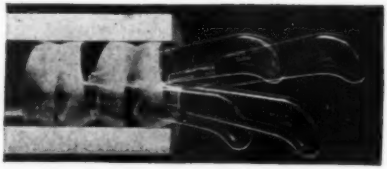
Standard Gage Co., Inc., Poughkeepsie, N. Y., announces it is now in production on Tebo Gages, as sole licensee in the Americas.

Tebo Gages are interesting, both in construction and performance. The gaging head is a section of a sphere with a protective plating of hard chromium. Due to this plating and because the points of gaging contact are as numerous as the number of theoretically widthless lines which might be inscribed on the surface of a sphere, they retain their extreme accuracy over exceptionally long periods of service. Records of 50,000 gagings with a single gage are said to be on file.



TeBo Gage used in bench inspection of ball bearing I.D.'s.

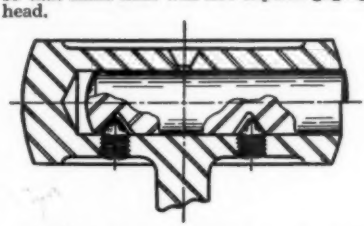
The ideal spherical head contributes to frictionless operation and effortless insertion and withdrawal of gaging head when checking bores. It eliminates possibility of the gage becoming jammed within the bore and provides a simple operating technique not possible with other types of gages. On the periphery of the spherical head is a smaller projection which is also a part of a true sphere. This projection may be adjusted to the limit of maximum tolerance or to compensate for wear. Adjustment within reasonable limits is easily made by means of two tapered screws acting against the inset in a "V". By adjusting these screws, the "no go" factor can be increased or decreased within the gage's dimensional limits and held constant to various tolerances. This adjustability is a recent Standard improvement.



Phantom view of TeBo Gage at different positions in a bore, showing how every section of a bore can be checked readily with this improved fixed limit type gage.

When a bore being gaged is between minimum and maximum tolerances, the Tebo gage head enters freely and may be rocked on its horizontal axis until stopped by contact of the projection with the bore wall. If the bore exceeds maximum tolerance, the gage handle, when released, drops below the bore axis. It will also drop when the gage encounters, at any station, such irregularities as out-of-roundness, taper, belling, ovalness, or even faulty finish.

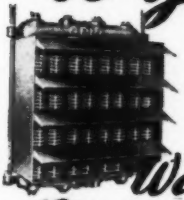
The handle is precisely balanced to the weight of the head. Its position, as well as the "feel" of the gage, indicates the internal condition of the bore even to relatively inexperienced operators. If the gage is properly handled, it will supply information about bores in aluminum or cast iron as precisely as when the piece is of hardened metal. Handles are insulated, so that hand heat will not expand gaging head.



Standard Gage Company now has in preparation an illustrated booklet describing these improved Standard TeBo Gages in detail and is inviting pre-publication requests for copies which will be distributed to inquirers as soon as they are printed.

GRID

10 Years ON SEVERE HEATING SERVICE Without Maintenance



AND HERES WHY!



★ One piece construction heating sections (patented) of high test cast iron that withstands steam pressures up to 250 lbs.

★ No soldered, brazed, welded or expanded connections to become loose or develop leaks.

★ No electrolysis to cause corrosion, breakdowns, leaks, or heating failures.

HIGH TEST *Cast Iron* HEATING SECTIONS

Is it any wonder that plants all over the country find GRID Unit Heaters outlast other types of heating equipment, without maintenance? GRID Unit Heaters have been in many plants for 10 years (names on request) without maintenance. Complete data and capacity tables upon request.

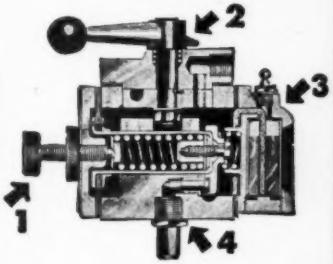
D. J. MURRAY MANUFACTURING CO.
WAUSAU, WISCONSIN

GRID

Marton



This convenient unit is adaptable for all air operated machines wherever air control is required. Pressure regulator, gauge, strainer, lubricator and control valve are combined in one efficient, time-saving mechanism.



1. Pressure Regulator—accurately varies pressure from 5 lbs. up to 100 lbs.

2. Control Valve—arranged for two-way operation of double-acting cylinders and mechanisms.

3. Lubricator—maintains constant, efficient lubrication.

4. Strainer—keeps out final dirt and foreign matter.

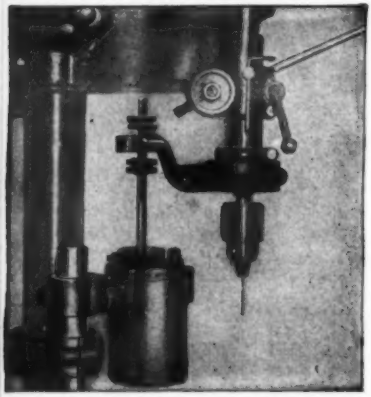
SMALLPEICE, LTD., 140 Elliott Street
Beverly, Massachusetts
13/14 Parkshot, Richmond, Surrey, England

SMALLPEICE

Machine Tools and Equipment Manufactured in U. S. A. and Great Britain

COPILOT FEED REGULATOR

A new drill press attachment known as the Copilot feed regulator has been developed by Special Devices Co., Berlin, Conn. It is shown installed on a 14" bench type drill press. It may be easily attached to hand feed drill presses and is claimed to enable inexperienced operators to produce good work right from the start.



It prevents violent contact of drill with work at start and is said to prevent dropping of spindle when the drill breaks thru. Backlash in spindle feed mechanism is held back which makes it helpful in drilling of plastics and thin materials. It permits free action for chip clearing and checks downward motion of drill before contact is again made with bottom of hole. It minimizes fatigue and nervous tension in small hole drilling. Operating on a hydraulic principle, it is said to be self-lubricating and the metering valve automatically clears itself.

Available in a special model engineered to specific jobs, it provides variable regulating characteristics. If the drill is to pass thru a cavity, the drill will drop with little resistance thru the cavity and be checked before making contact. In straight reaming of a tapered hole resistance can be made to vary in direct proportion to the amount of metal to be removed as the reamer progresses.

GAY-LEE CUTTERS

The Gay-Lee Company, 117 East Hazelhurst, Ferndale 20, Mich., specialize in the manufacture of Gear Tooth Rounding Cutters and/or Pointing Cutters. They also make Gear Tooth Burring Cutters to customers' blue prints, or will design proper tools for the work intended upon submission by the customer of his gear prints.

In addition, they make Clutch Tooth Milling Cutters used in milling the teeth of clutch gears.

Additional information will be sent on request.

SUMP TANK CLEANING

A speedy, modern method of cleaning sump tanks is provided by the units made by W. R. Carnes Co., Madison 4, Wis. These units do the cleaning job in a fraction of the usual time required and less machine "down-time" for cleaning means more production. Grinding wheels and cutting tools last longer when coolant or oil is clean. It's possible to reach into small, inaccessible places and make a thoro job of cleaning.

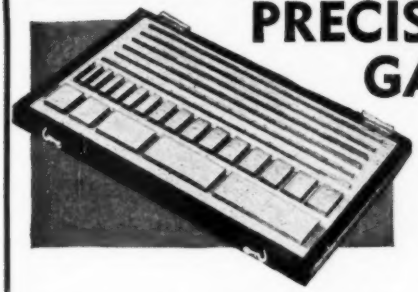
The vacuum pump, driven by a ½ hp motor, creates a vacuum in the large tank. A powerful suction is thus provided in the hose that is put in the sump tank, drawing the sludge, chips and old coolant or oil into the sludge basket. The clean oil or coolant collects in the tank proper.

When the tank becomes full, a float control activates the automatic vacuum-controls on the pump unit shutting it off. At the same time a pilot light indicates tank is full. Sludge basket is easily removed for emptying and the tank is drained thru the bottom.



It is also possible to reverse connections on the vacuum pump so that pressure may be produced in the tank proper, emptying the tank thru a discharge hose.

PRECISION GAGE BLOCKS



Special Offering . . .

Complete 82 Unit Set of Precision Gage Blocks — Accuracy .000008 packed in attractive lined Hardwood Case.

Made of selected chrome alloy steel and fully seasoned.

Each set fully guaranteed and sold on money back guarantee.

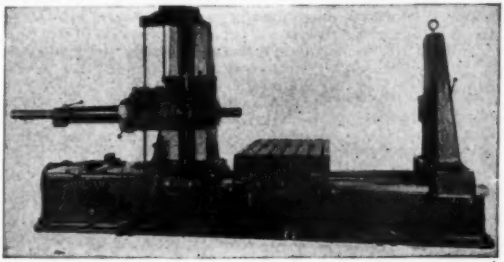
Regular Price.....$295.00
Our Price.....$195.00
(Quantity Limited)

We shall be pleased to submit descriptive literature and specifications on our gage blocks.

LAFAYETTE TOOL & SUPPLY CO.
128 LAFAYETTE ST. NEW YORK 13, N. Y.
Specializing in Machine Shop Tools

PORTAGE No. 4

HORIZONTAL BORING, DRILLING & MILLING MACHINE



● Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

G-1 DO-ALL SURFACE GRINDER



A new model G-1 DoAll Surface Grinder is offered by Continental Machines, Inc., 1300 S. Washington Ave., Minneapolis 4, Minn. With standard grit wheels, this machine is said to produce a fine finish to within six micro inches. An innovation in design permits operator greater convenience and closer inspection of work while grinding.

Built for tool room use and light production work where accuracy is essential, it has a table travel of 21" and transverse travel of 7½" with a vertical wheel head adjustment of 12", using a 7"x½"x1¼" wheel. Extreme rigidity, so important to precision finish, is found in the scientific balancing of the 2200 pound weight of the machine. This is almost double the weight usually found in a tool room surface grinder.

For instance, the column which extends from bottom of base up to the spindle is recessed into base to give greater rigidity to spindle. This permits a much greater way area, which is hand-scraped to a precision fit. The saddle has large, extra heavy double V ways to prevent "angle feeding" and to give longer life. Total hand-scraped way area is 386 square inches. The working area is completely supported, eliminating any "over-hanging", to assure parallelism and flatness over entire working area. The 21" transverse travel and 7½" cross feed travel allows plenty of working area for parts being ground on a 6x18" chuck.

An especially constructed combined hydraulic control unit eliminates piping, usually found in a surface grinder of this type. This one unit controls the five hydraulically actuated movements of machine and was designed especially for this grinder so no adjustments are necessary.

When under automatic operation, the cross feed screw disengages automatically.

Standard equipment includes the direct motor driven, precision ball bearing spindle. The grinder spindle head is built especially for this spindle and is lapped for a precision fit. Wheel head is raised or lowered by means of a graduated hand wheel operating the vertical adjustment screw thru a single gear contact for positive movement. Gears are hardened and ground with the vertical adjustment screw operating thru a 4" bronze nut to minimize wear. An exclusive feature is the adjustable wheel guard which enables operator to lower guard to compensate for wheel wear or adjust for individual application. Guard is also removable without taking off wheel.

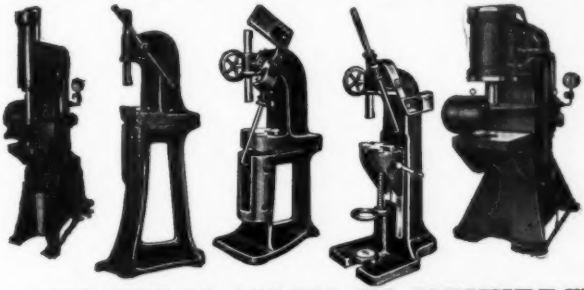
The special base design is recessed to provide knee room for operator. Since the saddle extends only 8½" from table, it allows operator to see his work without straining. Electrical controls are recessed into front of base for most convenient operation. Cross feed screw is located in center of saddle to assure smooth cross feed action. These features permit operator to sit down at his work and observe closely the grinding of each job to a precision finish with complete dimensional control. Grinder can be changed from full hydraulic operation to full manual operation in an instant. Manual operation of table is exceptionally smooth due to the hardened gears and roller bearings.

The inbuilt hydraulic oil reservoir and pump unit is rubber mounted which isolates pump and motor vibration from transmission to the work piece. Complete automatic pressure lubrication is provided to all ways and moving parts.

ROTARY SHEAR ATTACHMENTS

The Quickwork Div., Whiting Corp., Harvey, Ill., announces Bulletin No. QW-120, featuring applications and operation of attachments used on Rotary Shears. Illustrated thruout with pictures and drawings, this 8-page bulletin enables the reader to understand clearly the wide range of work that can be handled effectively by these attachments. Circle cutting, slitting, joggling, and flanging attachments are all featured.

For AIRCRAFT and MUNITIONS



1883

GREENERD

The Originators of the Arbor Press

1944

PRECISION WORK IN MANUFACTURING

65 Standard Styles and Sizes. Manually operated presses ¼ to 35 tons pressure. Motor driven hydraulic presses 1½ to 30 tons pressure.

Let us send you our catalog No. F.

GREENERD ARBOR PRESSES

NASHUA Est. 1883 NEW HAMPSHIRE

LEACH External Grinder

$875.00

Fully Equipped

Grinds work from ¾" to 11" in length and from ⅛" to 7" in diameter.

Our dealers will help you fill out necessary priority forms. Write us today for your nearest dealer's name and address.

Send for Descriptive Literature

EXCELLENT DELIVERIES



Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World

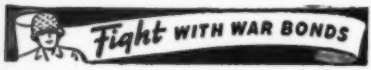


Errorless "same-size" facsimiles of anything up to 18"x22". Eliminates steno-copying, tracing, proof-reading. Photo-copies direct from letters, blueprints, graphs, tracings, telegrams, receipts, shop orders — anything written, printed, drawn, photographed. Accepted as legal evidence. Endless uses. Big savings. Used by industry, Government and engineers.

No Camera — No Film — Easy to Use

Any employee quickly becomes expert. Use A-PE-CO on any desk or table. It's simple; fast. No moving parts. Saves other equipment. Conserves man-hours. Low cost per copy. Low investment. Get *all* the facts. See how *you* can save. Immediate delivery.

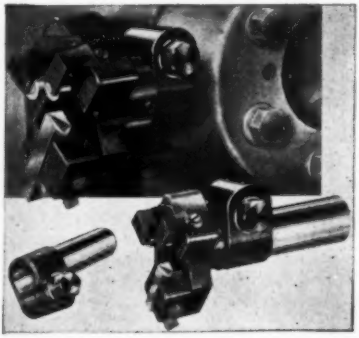
American Photocopy Equipment Co.
2849 N. Clark St., Dept. C-104
Chicago 14, Illinois
Representatives in principal cities
In Canada: Railway & Power Engr. Corp., Ltd.



SCREW MACHINE ADAPTER

A new Boyar-Schultz Model H Screw Machine Adapter is said to double the capacity of Screw Machines.

Operators know that screw machines of a given size can use only the tools made for that size machine unless an adapter is made up. This is a costly operation and accounts for a lot of lost machine time.



The Model H Adapter is designed to permit use of more than one size tool on a single size screw machine. It is precision made thruout, from the best obtainable tool steel, hardened and ground to assure correct fitting. At present it is made in four sizes:—$\frac{5}{8}$" to $\frac{3}{4}$" short; $\frac{5}{8}$" to $\frac{3}{4}$" long; $\frac{5}{8}$" to 1" and $\frac{3}{4}$" to 1". Larger sizes will be available soon. For further details address Boyar-Schultz Corp., 2108 Walnut St., Chicago (12) Ill.

SHOT PEENING BOOKLET

The result of many months' laboratory research, a study titled "Shot Peening and the Fatigue of Metals", by H. F. Moore, for many years Research Professor of Engineering Materials at the University of Illinois, has been published by American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind. Among the subjects covered are:—Types of structural damage of metals . . . how shot peening increases resistance to plastic distortion . . . the origin of fatigue cracks . . . the effects of cold working . . . measurement of shot peening intensity . . . examples of increased fatigue life from shot peening . . . and many others. The booklet is illustrated by microphotographs, charts and tables, and contains research data never before published.



Here's NEW Convenience for GAGE USERS!

PRECISION PIN SETS



Complete sets progressively stored — all gages right at hand for immediate use — protected from dirt and moisture.

NUMBER and LETTER		FRACTIONALS
Drill Sizes	Drill Sizes	1/64" to 1" in increments of
1 to 60	A to Z	1/64"
(86 pins all in one cabinet)		(64 pins all in one cabinet)

Highest quality hardened gage steel, ground to utmost precision and UPPCO-Lapped for enduring accuracy. Tolerances to individual specifications. Handsome, durable, walnut-finished cabinets 9⅞"x15½"x4½" deep. Wire or write. When asking prices, *specify tolerances.*

Mfrs. of DUBLIFE Reversible Plug Gages, and others of A. G. design. Ask for catalog.

UNITED PRECISION PRODUCTS CO.
3522 W. BELMONT AVE. CHICAGO 18, ILL.

SAVE TIME ON INTRICATE **ANGULAR SET-UPS . . .**

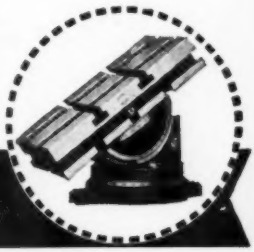
MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

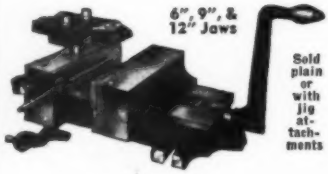
The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

Immediate Delivery
WRITE FOR INFORMATION

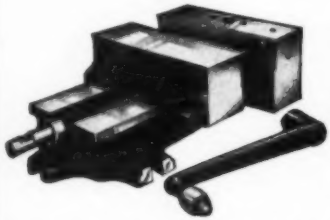


MASTER TOOL CO.
161 HIGH STREET • BOSTON, MASS.

"The tool of a thousand uses"



GRAHAM MULTI-PURPOSE VISE



With its assortment of special jaws and attachments, this vise serves hundreds of jig and fixture purposes on drill press, planer, shaper, miller, grinder, radial. Its flush, parallel, four-square construction is a great advantage in accurate positioning for repeat-operation work. Made in sizes from 124 lbs.

Request Illustrated Price Circular

GRAHAM MFG. CO.
57 Bridge St., East Greenwich, R. I.

GAUGES REWORKED

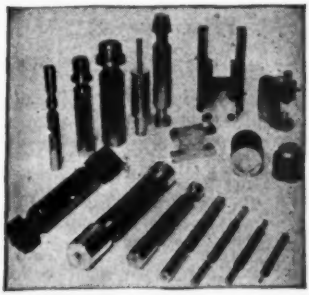
Worn Gauges Salvaged

Obsolete and Redesigned Gauges Reworked

Plain Plugs, Rings, Flush Pins, Built Up Snaps

OWN HARD CHROME PLATING PLANT

QUICK DELIVERIES



New Gauges

Plain Plug, Ring — Taper — Progressive, Wire type — Flush Pins — Flat, Solid and Built up Snaps.

Adjustable Limit Snap Gauges.

Standard Thread Plug and Ring Gauges.

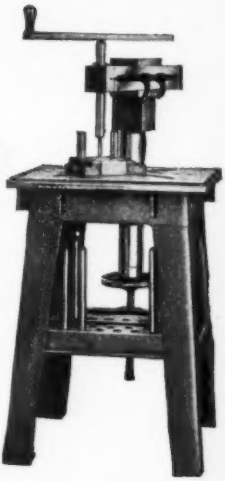
Special Gauges. Small Fixtures.

MIDDLESEX
GAUGE AND TOOL CORPORATION
526 W. 48th St., New York 19, N. Y.

Quotations and Literature on Request

PRODUCTO

UNIVERSAL HAND TAPPING MACHINE



This sturdy heavy duty unit covers a wide range of tapping and reaming jobs and will soon repay its cost to you by the savings which it makes possible. Let us send bulletin giving full details and specifications.

The use of a machine to guide taps straight in a hole is a "must" in any tool and die room or machine shop. In fact, it is the accepted and only satisfactory way to do the job. The Producto Universal Hand Tapping Machine insures accurately tapped holes — prevents tap breakage — requires no setting up — is all ready for instant use, and the job is done easily and quickly.

The PRODUCTO MACHINE COMPANY

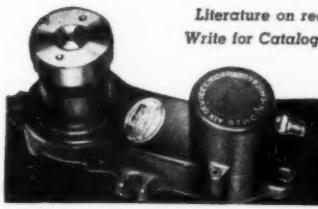
990 HOUSATONIC AVE., BRIDGEPORT, CONN., 3017 MEDBURY, DETROIT, MICH.

Accurately holds the depth at the same time it automatically centers parts for drilling, milling, tapping, etc. Needed in every plant where second operation work is done. Also for assembly or wherever a holding fixture to do precision operations is needed. Uses Brown and Sharpe type screw machine collets and simplifies "setting-up" operations and in most instances eliminates the making of jigs or fixtures.

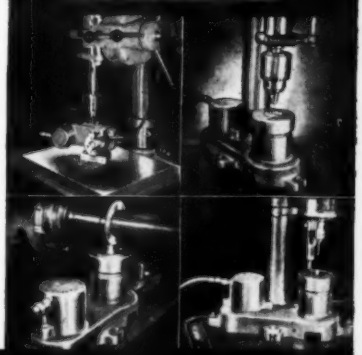
Has low consumption of air and its simplicity of construction eliminates expensive repairs.

Four models—No. 00—No. 0—No. 2 and No. 2 Special. Collet capacity from 1/16" to 1¾".

Literature on request.
Write for Catalog Sheet.

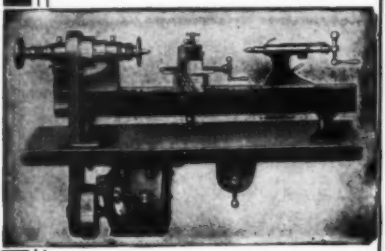


Redmer AIR CHUCK



REDMER AIR DEVICES CORP.
608 W. WASHINGTON BLVD., CHICAGO 6, ILL.

THE "Stark" PRECISION BENCH LATHES



With Motor Drive Unit
(9 Speeds)

Dependable for long service on exacting work which they handle with facility and speed. Records of 20 years continuous service are not unusual.

Write us your requirements. Now 4 good sizes, ¼", ½", ¾" and 1" collet capacity.

Stark Tool Company
Established 1862
Waltham, Massachusetts
Originators of the American Bench Lathe

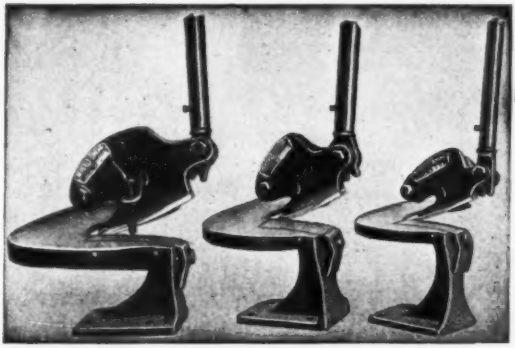
VIMCOLIGHT



CANCELS OUT THE "SHADOW MENACE"

It's remarkable how glareless, clear, shadow-free VIMCOLIGHT conserves the EYE-POWER of machine tool operators. This modern, improved lighting helps cut down spoilage and steps up production because it reduces eye fatigue and strain. VIMCOLIGHT spotlights the work at exactly the desired angle and is quickly adjustable from one position to another. Inexpensive . . . easy to install . . . used as standard equipment on many leading machine tools.

VIMCO Manufacturing Co.
109 Chenango St. Buffalo 13, N. Y.



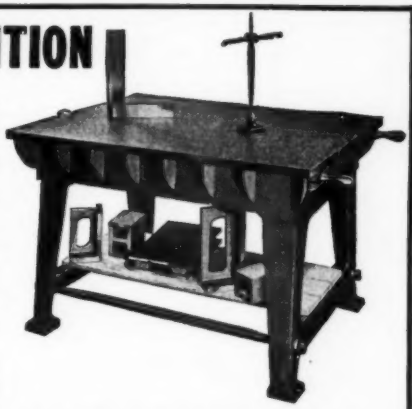
Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights or irregulars on War orders you can speed 'em up with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16" mild steel and 10 ga., stainless.

THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, Ill.

A USEFUL ADDITION



Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

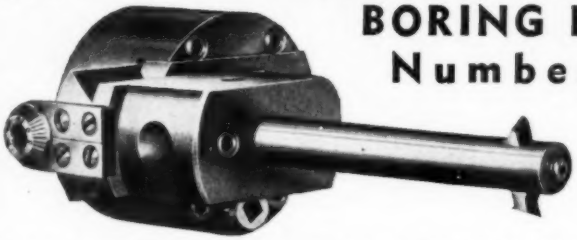
We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907

165 SO. BARCLAY ST., MILWAUKEE 4, WIS.

MEYER MICROMETER OFFSET BORING HEAD Number 20



The number 20 Micrometer offset boring head is of special dovetail design with two tension gibs. This head is especially designed for offset boring or facing.

The tool block has an offset of 1½" and will hold boring bars or tool perpendicular or parallel to the face of the head.

Write for illustrated bulletin.

MEYER TOOL & ENGINEERING CO., Saginaw, Michigan



This Circular Has Helped CUT COSTS 50%

on

ANGLE MACHINING JOBS

This informative circular has introduced hundreds of plants, large and small, in all industries, to the "UNIVERSAL" 3-WAY ANGLE-SET VISE.

Thousands of extra copies have been requested by scores of prominent manufacturers for distribution to heads of their Tool Rooms, Machine Shops, Repair and Assembly Departments and to Branch Plants.

It contains the complete story of how to use the "UNIVERSAL" 3-WAY ANGLE-SET VISE to *Cut Costs — Speed Work — Lessen Labor* on all angle-set jobs. Complete specifications. 12 Job Application Sketches that suggest new methods of handling angle-set jobs: special information on Tool Bit Grinding: a suggested Cost Analysis form.

It shows you how you can save 1/3 to 1/2 the time now spent on set-ups — reduce your costs and get more out of your present equipment — and ease many headaches.

Send for your FREE copy of this valuable information today.

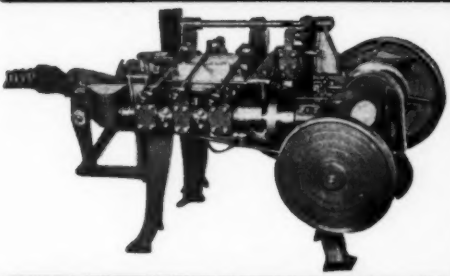
UNIVERSAL VISE & TOOL CO.

133 Main Street

PARMA, MICHIGAN

TO MEET TODAY'S *INDUSTRIAL REQUIREMENTS*

THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

DESMOND GRINDING WHEEL DRESSERS



Desmond Hex Dresser



Desmond Heavy-Duty Dresser



Desmond Huntington Dressers

Our Desmond Huntington Cutters are made in all sizes.



We manufacture only complete line of dressers and cutters on the market, and will be glad to send samples for trial. Write for copy of our new catalog and name of your nearest jobber.

ARMY-NAVY E

THE DESMOND-STEPHAN MFG. CO.
URBANA • OHIO

THE SPENCER SUMP-VAC



A Spencer vacuum producer, mounted on a closed tank on wheels removes liquid and sludge from sump tanks in two to 10 minutes compared with half an hour or more by former methods. The rate of pick-up of liquid is 40 gallons per minute.

Tank capacity is 125 gallons or enough for three to five average sumps. A filter basket collects chips and heavy sludge. A Neoprene ball float valve prevents overfilling machine. The machine is emptied by gravity in two minutes or by turning of the valves provided with the machine and connecting hose to the drain valve, liquid can be discharged under approximately 3 lbs pressure. This permits raising the liquid to a height of 6 ft emptying the tank into a drum or other container for easy disposal. No priming is necessary—and all material in the sump tank is cleaned out by air vacuum after the liquid is removed.

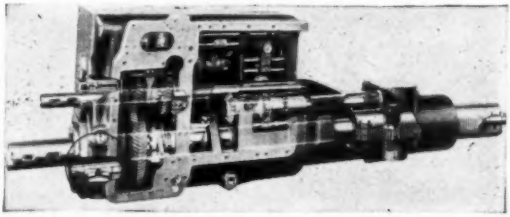
Sizes are ¾ to 1½ hp, universal or single phase motors, 25 to 60 cycle, 110 or 220 volts or d-c; 12½ foot vacuum hose and 50 foot cable extension. Bulletin will be sent on request by The Spencer Turbine Co., Hartford 6, Conn.

FORGEABILITY OF STEELS

"Evaluating The Forgeability of Steels," latest publication of The Timken Roller Bearing Co's., Steel & Tube Division, Canton, O., is an 8½x11", 78-page book, containing recommended forging temperatures of 68 steels, as determined by the hot twist test conducted in company laboratories.

The apparatus and procedures used are described and the results of tests on various steels interpreted.

STEEL TUBING FOR SPINDLE SLEEVE BUSHINGS



Tool steel tubing, often employed to save time and cost in the manufacture of cutting and forming dies and tools, is now being used for bearings, heavy-duty bushings, sleeves and other machine tool parts.

Illustrated is a table-type milling machine headstock incorporating (lower left) main spindle sleeve bushings made of tool steel tubing. In order to provide and maintain a close fit between spindle and spindle sleeve, two bushings are inserted, their internal bore being ground after they have been inserted in the sleeve.

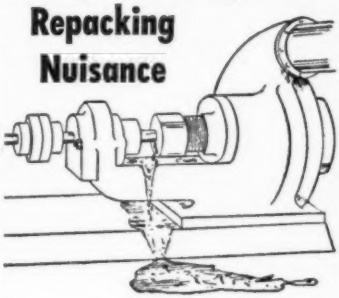
Tool steel tubing was chosen for this job, replacing bronze bushings previously used, in order to prevent excessive wear and maintain the necessary close fit over a long period of time.

Little change of design was required in the replacement, the only changes being in the direction of simplification, because it was possible with tool steel tubing to use straight bushings and eliminate a take-up device which had been necessitated by the bronze bushings, which were tapered.

No difficulties have been experienced with the tool steel tubing bushings, and replacements are an exceptional occurrence, according to the machine tool manufacturer. Tool steel tubing is supplied by the Bissett Steel Co., 945 East 67th St., Cleveland 8, Ohio.

ELIMINATE

Pump Leakage and Repacking Nuisance



with

SYNTRON

REPLACEMENT SHAFT SEALS

A tested and proven way to eliminate pump shaft leakage and reduce friction.

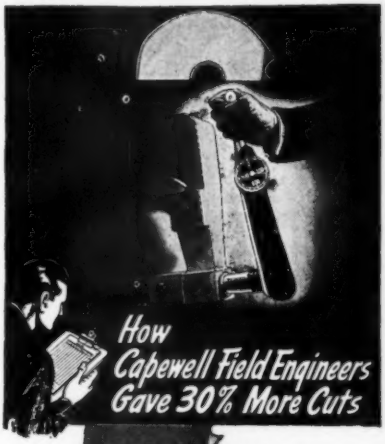
Completely self-contained, self-lubricated and pressure balanced.



Simple and easy to install. Internal or external application. For all sizes of shafts.

Catalog literature on request.

SYNTRON CO.
300 Lexington
Homer City, Pa.



How Capewell Field Engineers Gave 30% More Cuts

On a job cutting 4½" square chrome tungsten alloy billets for propeller parts, Capewell's Technite Hack Saw Blades cut time while increasing blade life. Lower production costs are becoming increasingly important. Arrange through your mill supply man for a consultation with a Capewell Field Engineer.

His Analysis Covers:—

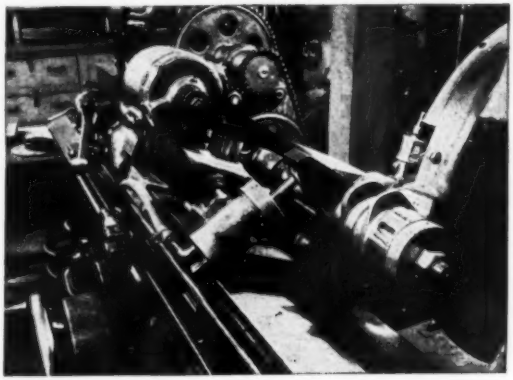
1. PRECISION TENSION
2. STUDY OF MATERIAL
3. CORRECT TEETH

THE CAPEWELL MFG. CO.
Hartford, 2, Conn.

CAPEWELL
HACK SAW BLADES

The trend is to TECHNITE, the molybdenum high speed hack saw blade

REVERSED GRINDER FORMS PERFECT MASTER CAMS



The making of master cams for Diesel intake and exhaust valves and fuel - injection mechanisms has been simplified at Joshua Hendy Iron Works, Sunnyvale, Cal. The work is performed by a grinding attachment with a small grinder and spindle replacing the master rotor, and a round steel disk substituting for the normal large grinding wheel and operating in conjunction with the cam-grinding fixture.

The device, which can have many other applications in the grinding of precision parts, involves little but the reversal of the functions of grinding wheel and rotor. When set up, it required only about an hour each to cut the two master cams needed for the manufacture of working cams for the engines.

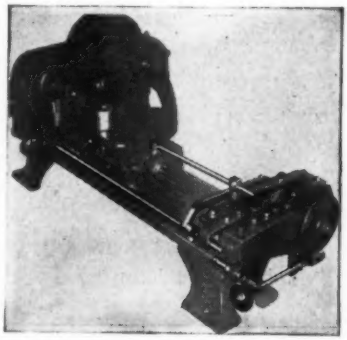
A working master cam, filed to a tolerance within plus or minus .001", is in constant contact with the large disk to form the shape of the cam being ground. It is kept in position, under constant pressure, by an air cylinder. The cam being ground is mounted on the same shaft in a corresponding position. Grinding is done by a small grinder, mounted where the master rotor would normally be. The fixture is powered by a ½-hp Dumore grinder motor. The large disk is of exactly the same size as the normal grinding wheel used in making the engine cams, altho engineers have found that in practice, this grinding wheel can be reduced in diameter up to 1" without violating tolerance limitations.

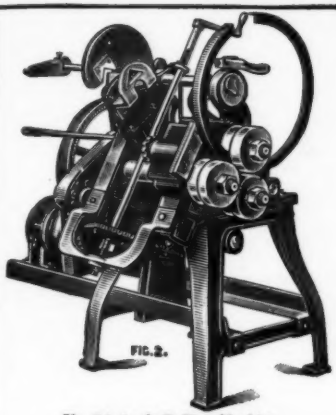
NEWTON AUTOMAT

Hand-operated turret-equipped bench lathes are quickly converted into reliable automatics by the Newton Automat, now in quantity production, according to the makers. the Newton Mfg. Co., 706 No. Heliotrope Drive, Los Angeles 27, Cal.

The Newton Automat actuates cross slide, bed turret and chuck; eliminates all manual operations excepting original setups and cutting tool replacements. It is of simple, rugged, enduring construction, designed to be as fool-proof as a mechanical device can be. It is equipped with a set of standard cams which will handle almost any job. The member which actuates the cross slide is a torque rod which cushions the shock of forming and cut-off operations, and also assures uniform feed, accurate repeating, and prolongs tool life. An automatic cut out, quickly adjustable to work of different character, eliminates tool spoilage and parts rejection. A Schrader 3-way valve operates any pneumatic collet closer.

Installation is easy. The units are available for South Bend, Logan, Atlas, Craftsman, Sheldon, Clausing and similar bench lathes. Shops with manpower shortage problems and forced to write off reject losses incurred by inexperienced operators and by operator fatigue should find the Newton Automat a practical, highly efficient means of increasing output and profits.





No. 14 Angle Rolling Machine

ROLLS ANGLES, TEE IRON, PIPE, FLATS, ROUNDS AND SQUARES

CAPACITY—2"x2"x¼" ANGLE

HERE IS A

Machine

THAT HAS FOUND ITS WAY INTO

40 States

used by Manufacturers of

SHIPS—PLANES—TANKS—AUTOMOBILES—ENGINES—FURNACES—FARM MACHINES AND METAL PRODUCTS OF ALL KINDS

also by

U.S. ARMY—U.S. NAVY—N.Y.A. UNIVERSITIES

• • • There's a Reason!

EXCELSIOR TOOL & MACHINE CO. EAST ST. LOUIS, ILLINOIS



We Solve

TOUGH TOOLING PROBLEMS

GUARANTEED ACCURACY — PROMPT DELIVERY

We specialize in precision work and in getting it out ON TIME!

End Mills, Reamers, Countersinks, Dovetail and Circular Form Tools, Shell End Mills, Gages of all Types, Centerless Grinding.

For Quick Quotations, Write—Wire or Phone BUCkingham 3417

ANDERSON AND QUIGLEY CORPORATION

2329 Nelson Street, CHICAGO 18, ILLINOIS

ENCO 6" SQUARE TURRET

Enco Mfg. Co., Dept. 53, 3321 Montrose Ave., Chicago (18) announces a new 6" Square Turret Tool Post for use on lathes with 16" swing, and larger lathes. The center post, almost 5" in diameter, gives extreme rigidity under heavy cuts for the larger tools at high speed.

The turret block is designed to mount up to 1¼" tool bits or No. 2 Tool Holders for ⅜" square bits where additional flexibility in operation is required. The indexing mechanism, being self-contained, eliminates chip interference and assures maintenance of an accurate setting in production. Mac-it Tool Post Screws are standard on this model.

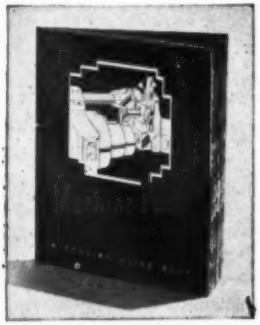
Using hardened steel construction thruout, only one week is required for turrets made to specifications. Model 6-S is also available from stock with lower portion of base left machinable for quick adaptation to the lathe.



TOOLING GUIDE BOOK

A tooling guide book for lathe operators, entitled "How to Machine Parts on Turret Lathes," has been completed by the Operators Service Bureau of The Warner & Swasey Co., Cleveland.

It condenses in simplified and well-illustrated form, specific directions for performing all types of turret lathe work, and is the fifth step in a long-term program of operator education inaugurated by the Company some four years ago.



First was inauguration of a monthly publication called "Blue Chips", for distribution to turret lathe operators. The second step was publication in 1940 of a 240-page text book which constituted a full-length operator's manual on turret lathe operation. Third, came an illustrated lecture "Ten Ways to Get Better Results," presented personally by Warner & Swasey engineers in 950 plants. In 1942 came the fourth step—a sound motion picture, entitled "Chips," showing operators just what happens when the cutter is improperly ground or incorrectly set.

The current "tooling guide book" has been designed with an eye toward training problems that will arise in connection with postwar reconversion and the returning of veterans from overseas.

The book defines and describes basic turret lathe machining operations, internal and external; classifies work done on turret lathes into major groups, by nature of product; and explains briefly, and by diagram and illustration, the sequence of operations and tooling for each group.

Of particular interest is the wealth of photographic illustrations of kinds of work done on turret lathes—so that, except in a very unusual case, the operator can find in the book an actual picture of work corresponding to the job he has before him.

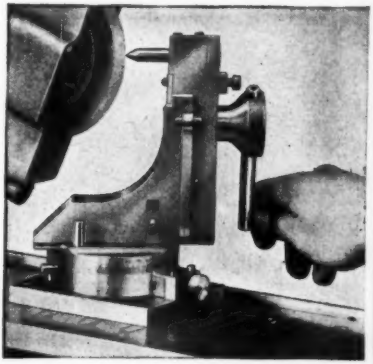
The tooling guide book, as is the case with all the material put out by the Company's Operators Service Bureau, is available to turret lathe operators generally, regardless of whether or not they work on Warner & Swasey machines. In order to give the book a definite value in the minds of the operators, a nominal price of 50 cents per copy is to be charged for it. It will be available to the general public at $1.00 a copy.

USE

Fluid-Motion for Modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION

The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable — regardless of cost.



FEATURES

Fluid-motion dressing
.0001" accuracy
Automatic centering
14" wheel capacity
Large range yet compact
Chatterless and dustproof

J. & S. TOOL CO.
477 MAIN ST. E. ORANGE 2, N. J.

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S. NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

BEWARE OF IMITATIONS!

Our machine carries the Butterfly trade mark.

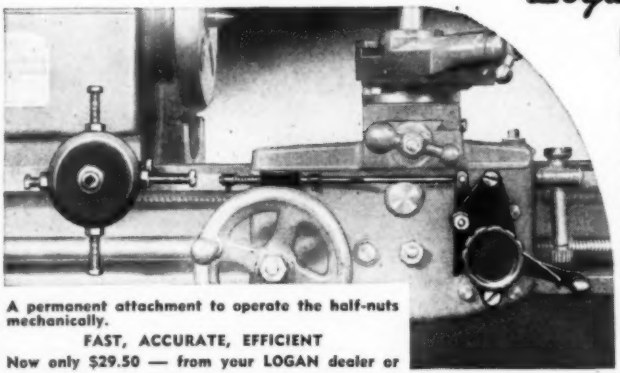
This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model E.L. 12" Table.



HARVEY MFG. CORP.
161 GRAND ST., NEW YORK
Phone CAnal 6-5170

Registered U. S. Patent Office

The New Ray Automatic Feed Control for Logan Lathes



Model No. 425-I for lathes with serial numbers above 20324.

Model No. 425 for others

(Also available for Atlas Lathes)

A permanent attachment to operate the half-nuts mechanically.

FAST, ACCURATE, EFFICIENT

Now only $29.50 — from your LOGAN dealer or

INDEPENDENT SPECIALTIES, 152 W. 75th St., Chicago 21, Ill.

WHY WASTE SKILLED LABOR ON DRILL GRINDING? ANYONE CAN SHARPEN SMALL DRILLS WITH A



BLACK DIAMOND

THERE'S no need to waste high priced skilled labor on grinding drills when any apprentice, with a single Black Diamond machine, can produce quantities of precision ground, small gauge and fractional drills with—lips of uniform length—correct angle and proper clearance. And the Web Thinning attachment grinds Notched—Colton or Crank Shaft Points just as efficiently.

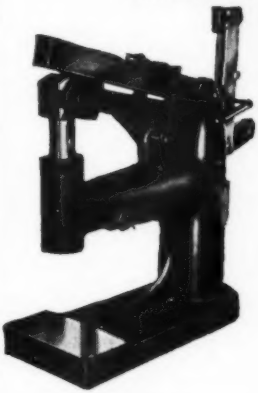
If you use quantities of small drills, singly or in gangs—save valuable war production time and labor by installing a Black Diamond Drill Grinder at once.

Write for full details.

BLACK DIAMOND SAW & MACHINE WORKS, INC.

45 NORTH AVENUE NATICK, MASSACHUSETTS

AUTOMATIC STAKING MACHINE INCREASES PRODUCTION With Unskilled Manpower!



Outperforms conventional Riveters on numerous jobs.

A shortage of skilled workers won't upset your staking machine production if you use the Automatic Staking Machine which, even in unskilled hands, is fast, accurate and thoroughly dependable.

Uniform blow of hammer makes it ideal for riveting movable joints; can be quickly and easily adjusted for various jobs.

Available in Three Sizes

	1	1-B	2
Stroke	2"	2"	2½"
Spindle	1"	1"	1¼"
Throat Depth	4¾"	4¾"	8½"

Now's the Time to Write for Descriptive Material and Prices.

WEBER MACHINE CORP.

59 Rutter Street **Rochester 6, New York**



ONLY $42.00

Complete

QUICK SHIPMENTS ON AA-5 PRIORITY OR HIGHER

NEW SAW-GUN

SAWS and FILES where no other tool can reach!

★ Now, many hard-to-get-at sawing and filing jobs that formerly required hours of time and the use of *several* tools, can be quickly handled with *one* tool—the SAW-GUN.

Propelled by electricity, compressed air or flexible shaft, this new tool will rapidly saw or file light and heavy gauge metals of every description, corrugated or plain. It's ideal for panel notching in metal, wood, plastics and other materials. In fact, the Saw-Gun may be used advantageously in a wide variety of applications.

Sold on money-back guarantee.

See Your Jobber or Write Direct for Quick Delivery!

MID-STATES EQUIPMENT CO.

2435 So. Michigan Ave. (SAW-GUN DIVISION) Chicago, Ill.

MORE POWER LESS WEIGHT

GRINDS
MILLS
DEBURRS
ENGRAVES
POLISHES
FINISHES



1/6 H. P.
35,000 R. P. M.
Weighs only
35 oz.

• Extra power and higher speeds for faster, smoother work on steel, non-ferrous metals, plastics, and most other materials. Speeds up to 35,000 r.p.m. *under load* reduce frictional wear on mounted wheels and cutters through lower operating pressure by as much as 50%.

Send
FOR THIS HELPFUL
16-PAGE BOOKLET

STREAMLINED PLASTIC CASE

Practically indestructible case fits the hand and mounts in stand, vise, or lathe. *Guaranteed shockproof on AC or DC without ground wire.* For close jobs attach COOLFLEX Flexible Shaft which extends full power and speed to 9-oz. cool-running handpiece.



PRECISE PRODUCTS COMPANY
1331 CLARK ST. • RACINE, WIS.

Precise

THE PRECISE 35

HANDLING BAR STOCK

Convenient methods of handling and storing bar stock mean much in metal-working plants. The particular means which can be most profitably employed often depends on the volume of bar material to be handled, as well as on the handling equipment for other kinds of materials.

There are some plants, which have powerful magnets on the job, carried either on traveling bridge cranes or on monorail hoists, used for general handling around the plant.

In many cases, such magnets are used to advantage for the handling of bar stock. Not so long ago, one was noted in operation in connection with a monorail hoist layout. The hoist and magnet were provided with a cable takeup reel.

One manufacturer of monorail systems has a type of lifting beam, for use in connection with handling of bar stock and like materials. The stock is stored in so-called cradles, which are really flat pieces of heavy steel, bent in the shape of a modified capital U. These have flat bottoms, and lifting rings arranged at the tops of the upright legs.

The lifting beams are suspended from the monorail hoists with two - point chain support. Each end of beam is provided with a double-strand lifting chain, arranged in such manner that it can be hooked into both lifting rings of the bar cradle.

It will be understood that a lot of bars are piled into two of the cradles mentioned, there being a cradle near either end of the bars. The lifting beam hooking into both lifting rings of both cradles, provides four-point lifting support to the bars as they are hoisted for transporting. The safety of such devices is easily appreciated.

Shops having frequent use for a small amount of bar stock, but seldom requiring it in large amounts, have found it especially convenient to keep bars of different types and sizes needed, in storage close to the points where they are usually required. Many places use racks with uprights at the ends resembling letter "A".

ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

6701 N. SIOUX AVE., CHICAGO

MULTIPLE HEADS

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

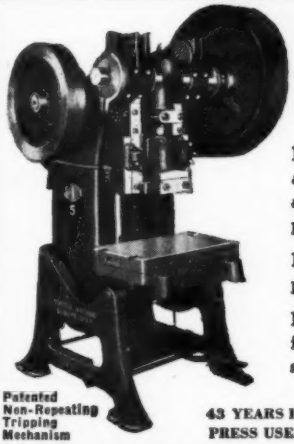


Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles



Super-Sensitive Fixed-Center Multiple Drilling Heads



Patented Non-Repeating Tripping Mechanism

UNLIMITED PEAK PRODUCTION

Much larger die space than average presses. Engineered and designed for unlimited peak production.

Reinforced construction at points of greatest wear.

If you want the best, send for illustrated catalog describing complete line TODAY.

With Modern JOHNSON POWER PRESSES

43 YEARS ENGINEERING EXPERIENCE BUILT INTO EVERY JOHNSON PRESS USED BY LEADING MFR'S. THROUGHOUT THE WORLD.

JOHNSON MACHINE AND PRESS CORP., ELKHART, INDIANA



Screw threads from 4½ to 64 per inch, any diameter, are accurately checked with only 6 pairs of New-Field Screw Thread Micrometer Buttons affixed to any standard micrometers with .235, .250 and .270 diameter anvils!

The set of six pairs of precision *buttons* costs less than any two standard screw thread micrometers that are of very limited usefulness. Yet these few, inexpensive New-Field Screw Thread Micrometer *Buttons* are the service equivalent of the large number of screw thread micrometer calipers required to check *all* sizes and diameters of screw threads, taps and gauges, and which would cost hundreds of dollars! The *Buttons*, of *unlimited* usefulness, are a remarkable economy!

Made of gauge steel, precision ground and lapped and guaranteed accurate, New-Field Screw Thread Micrometer *Buttons* require just a second or two to snap on, and will not slip out of adjustment. With proper care, they should last for years. Available in sets of 4 and 6 pairs, at a price every mechanic can afford.

NEW-FIELD
Newell-Canfield

Desirable Territory Open to Reliable Distributors

NEW-FIELD MACHINED PARTS COMPANY • 7160 Melrose Avenue, Los Angeles 46, California

ARBOR PRESSES

Arbor press work varies considerably in different plants. Where the arbor press is used for assembling a number of like parts by pressure, and the parts are relatively light in weight, it sometimes is profitable to have the ram return automatically to the upper position.

This can be done by spring action. An extension spring can be affixed to top end of ram and to a specially-arranged arm fitted out to overhand the top end of ram, so that the ram has its downward travel against the resistance of this extension spring.

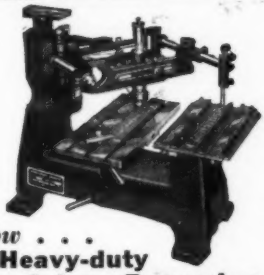
Again, the same result can be obtained on most small arbor presses, by drilling a couple of holes in top of yoke, of sufficient size and depth to receive two compression springs that will be used for returning the ram.

In the latter case, the top end of the ram will be fitted with a collar that can be placed at any point along its length by setscrews. Two pins will be arranged to extend downward from this collar in such manner as to register with holes in top of the yoke, and thus compress springs contained in those holes on the downward stroke.

In cases where the ram is other than round, a collar with a hole the shape of the ram can be produced by first rough-boring, and then shaping out the hole with an extension tool at the shaper. Such work is easily done.

In either event, return of the ram is spring actuated, and springs of the required return-value in strength must be selected. On fast work, the operator can be removing parts and replacing them with others, while the ram is returning of itself. The method is not applicable, however, to machines of large size. Saving of as much as 20 to 30% of operating time by this method is possible.

To obtain best results from equipment, ram alignment is necessary on the arbor press. Some presses have special adjustable gibs, to compensate for wear.



Now . . .

A Heavy-duty Bench-type Engraving and Marking Machine . . The PANTO Model UE-3

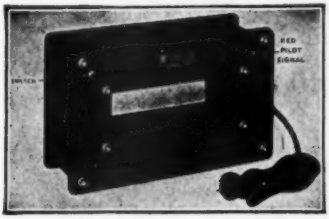
- HEAVIER CUTTING SPINDLE
- FOUR SPINDLE SPEEDS
- MORE PANTOGRAPH REDUCTIONS
- FORMING GUIDE ATTACHMENT

Plus the exclusive Panto feature . . . Interchangeable heads for engraving, electrical marking, and acid etching.

Write for new Catalog

H. P. PREIS ENGRAVING MACH. CO.
157A SUMMIT ST., NEWARK 4, N. J.

AMC DEMAGNETIZER
A TOOL ROOM NECESSITY



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only $32.50, complete as shown.

Write for full information.

ALOFS MFG. CO., Grand Rapids, Mich.

PRESTO-VISES Have Many *Big Advantages!*



"Clutch" Type, Toggle Action

For clamping parts of varying thickness.

1. Toggle for easy operating pressure.
2. Fast loading because of speedy, extra long jaw-travel away from work.
3. Jaw pressure adjustable according to type of work being held.
4. Extra large maximum opening and deep throat allows wide range in shape of parts held.

Each model is made in 3 sizes (3", 5" & 7" jaws)

Send for circular and engineering data.



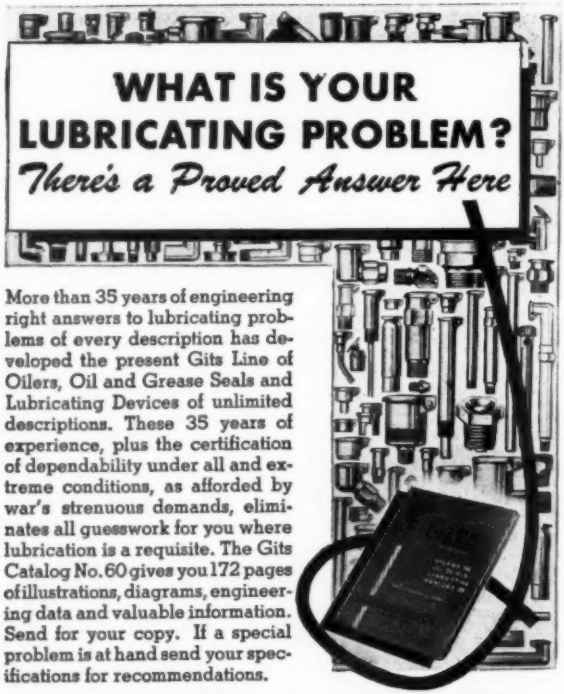
"Side-Action" Toggle Type

For clamping parts of uniform thickness.

Free CATALOG

D. A. SMITH & CO.
57 Selden Detroit 1, Mich.

PRESTO-VISE



tion of piston and check valves visible at all times. Such are found operating in capacities from ½ gallon to 20 gallons per hour, and are used chiefly for the proportioning of chemicals.

The ability to stop the motion of a fast-moving mechanism, in order to make a study of it in various phases, or, for slow speed observation of a fast-moving machine or machine part, permits making corrections and resulting in a better product.

For such duty, an instrument known as a stroboscope is used. These are available from a number of sources, and they are in use by some of our leading machine builders. One manufacturer of metal bandsawing machines makes use of a stroboscope, and has had phenomenal success in production of a highly efficient line of machines. The instrument is portable and self-contained.

For the visual inspection of ordinary parts, when such inspection must be very close, some type of magnifying glass is indicated. Magnifiers of many kinds have been used for such purposes in different plants.

One such requires no manipulation with the hands, but is worn very much like a pair of goggles, leaving both hands free to manage the work. Tool and die makers engaged on close, fine work, have found this kind of magnifier highly efficient.

On the other hand, some use illuminating magnifiers, which bring both magnification and adequate light to inspection.

VISUAL AIDS

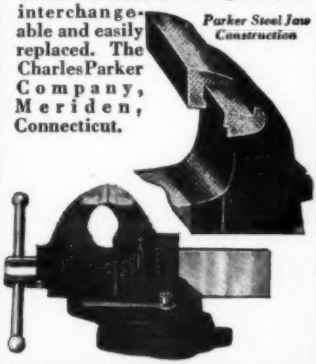
If one could look directly thru a mechanism while it is at work, and see exactly how it is operating, many relatively obscure troubles would be quickly understood. It is quite possible that this principle will be utilized to a considerable extent in the future. It is something for machine designers to consider.

Already, in fact, there is a transparent pump on the market, suitable for handling dilute acids, hypochlorites and many other chemicals, which is machined from a solid block of transparent plastic. This makes the flow of liquid, as well as ac-



WITH "GLOVES ON"

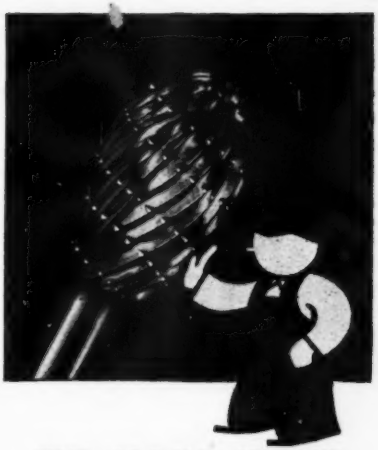
The tool steel jaws of the Parker Vise hold delicate work firmly, yet carefully. For the extra-hard, even surface of these jaws eliminates marring that comes from chipped, uneven jaw faces. For added protection, the entire top of the Parker Vise is covered with tool steel. Jaws are interchangeable and easily replaced. The Charles Parker Company, Meriden, Connecticut.



Parker Steel Jaw Construction

PARKER VISES

America's Oldest



WE MAKE WORN TOOLS *Sharp!*

REGRINDING SERVICE SPEEDS UP ACTION OF ANY ROTARY TOOL

To get real production on the finishing of metal castings, dies or patterns, you need the kind of rotary tools that take deep sharp bites. Yeomans Tool Regrinding Service puts your worn tools back in top-notch shape — makes them sharp-toothed and hard biting. For prompt service and a good resharpening job on your Burrs, Die-Sinkers, Reamers, Drills, End Mills and Milling Cutters of any size, shape or quantity send them to:

Yeomans
TOOL CO. - 2703 Bay St. Saginaw, Mich.

HARGRAVE Clamps



War plants are taking practically our entire output of clamps—and gaining increased efficiency and improved results. See your supplier—he'll do his best to help fill your needs.

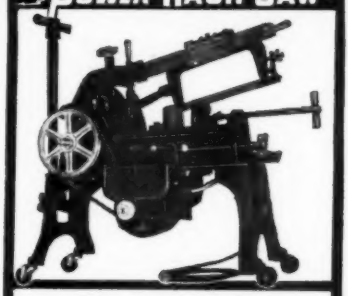
Stock sizes range from ¾" to 10" openings, from ½" to 16" deep. A complete line in all patterns and sizes.



THE CINCINNATI TOOL CO.
Founded 1879
1945 Waverly Ave., Cincinnati 12, Ohio

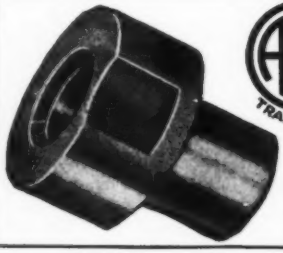
The CINCINNATI TOOL Co.

POWER HACK SAW



Low Priced Self-Contained
Portable
Ready to Work—Economical
Sturdy
Write for Bulletin No. 100

MILLER-KNUTH MFG. CO. OMAHA, NEB.



ABC TRADE MARK

HEADLESS PRESS FIT
HEAD PRESS FIT
FIXED RENEWABLE
SLIP RENEWABLE
HEADLESS LINERS

A.S.A. STANDARD
DRILL JIG
BUSHINGS

ALSO SCREWS • CLAMPS • LOCATING JIGS
Send for New Catalog No. 243

ACCURATE BUSHING COMPANY
447 NORTH AVENUE GARWOOD, NEW JERSEY



SAFETY DRESSER
For HAND GRINDER

½	Carat	$ 9.85
¾	"	16.50
1	"	25.00

LONG HANDLE — SAFETY FEATURE
LONG LIFE — ECONOMY FEATURE

SOMERSET INDUSTRIAL DIAMOND COMPANY
220 VIRGINIA STREET HILLSIDE, N. J.

NUMBERALL

NUMBERING MACHINES
for stamping into metal, etc.



Model 80

New, quick Set Machine. One wheel can be turned quickly by knurled knob for consecutive numbering.



Model 45

Platform for stamping Name Plates and other small articles.

Made in 1 to 20 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping.

Improved Type Holders. Hand or Press Style. Super Quality Steel Type.

Type is easily, quickly, loaded and unloaded. Simplest construction. A pin holds the type securely. No screws nor springs. Made in various sizes: 1/32" to ½" figures and letters.



Steel Type

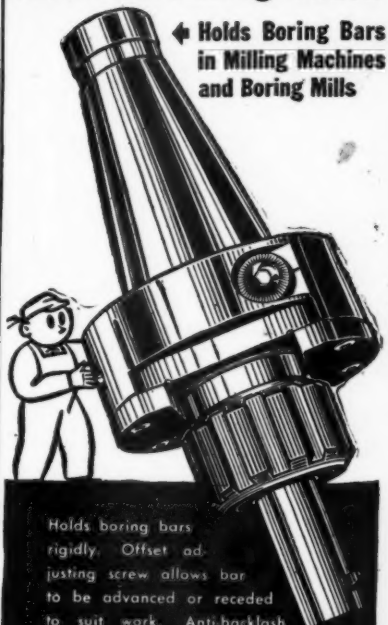
Model 23H

Write for literature BB7

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

ANNOUNCING! The new Universal Boring Chuck

Holds Boring Bars in Milling Machines and Boring Mills



Holds boring bars rigidly. Offset adjusting screw allows bar to be advanced or receded to suit work. Anti-backlash arrangement insures extreme accuracy. Two sizes, for bars ⅜" to 1" with milling machine taper or Morse taper shanks. Write for catalog.



Army-Navy "E" Flag Two Stars | Fighter Plane Given by employees | 20% Employees Bond deduction

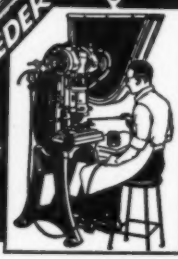
UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

LITTELL

Pres-Vac

SAFETY FEEDER

KEEPS HANDS OUT OF DANGER ZONE



YOU owe it to your workmen—to safe, fast production—to keep their hands out of danger zone—with the Pres-Vac Safety Feeder. Vacuum pick-up. Handles flat pieces of various weights and sizes. Trigger action. Mechanical Pickers available. **Request Bulletin**

F.J. LITTELL MACHINE CO.

4153 RAVENSWOOD AVE. CHICAGO 13, ILL.

REYNOLDS COOLANT UNITS ARE EFFICIENCY EXPERTS!



Showing Reynolds No. 1-S attached to milling machine

Designed to promote peak performance in machines using a coolant (cutting or soluble oils), Reynolds Coolant units are the answer to demands for increased production and longer cutting tool life.

REYNOLDS MACHINERY CO.

211 EDDY STREET, PROVIDENCE R. I.

New

LIGHTWEIGHT TORQUE WRENCH FOR LIGHT ASSEMBLY!

Patent Pending





Accurate to inch—ounces!

This new lightweight torque tool gives accurate readings of low torques required in delicate radio, ignition and fuel line assembly . . . in work with plastics and light metals where proper tension must be obtained but where too much pressure may damage the part.

An addition to the Apco Mossberg line of torque tools, it weighs as little as 6 ounces and fits any standard socket. Aluminum handle and sturdy brass scale with easily read figures. In six sizes: 0-100 inch ounces, 0-15, 0-30, 0-60, 0-100 or 0-250 inch pounds. Order yours today.

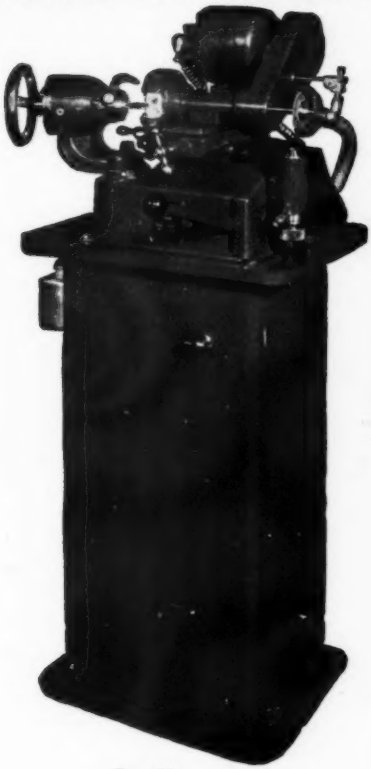
APCO MOSSBERG COMPANY

135 LAMB STREET

ATTLEBORO, MASS., U. S. A.

Other Apco Mossberg Torque Tools in Higher Ranges

HYBCO TAP GRINDERS



For Sharpening

CHAMFER - FLUTES - SPIRAL POINTS

CAPACITIES:

Machine Screws to 1½" hand taps.

Can be arranged for any number of flutes —right or left hand.

ALL TAPS HELD BY SHANK.

Can be sharpened after center is destroyed.

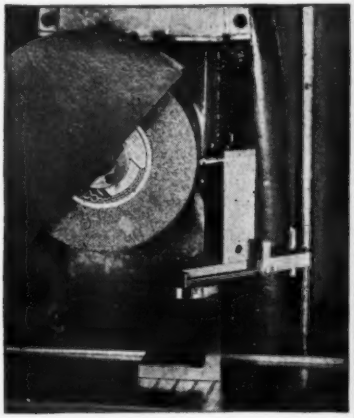
Write for catalog—and send us your problem.

HENRY P. BOGGIS & CO.

1279 W. 3rd St. Cleveland, Ohio

The FORM-MASTER

ANGLE AND RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in horizontal position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. diamonds and instrument case included. $150.00 complete.

It readily produces: Any desired angle; Convex radii to 4"; Concave Radii to 7". On 7" wheel.

Specifications: Base 3"x3", height 8½"; Wheel capacity 10"; Angular travel 3".

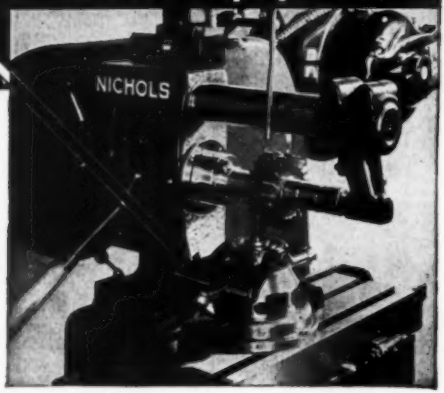
For information or a demonstration CALL YOUR SUPPLIER.

MANUFACTURED BY

J. & S. TOOL CO. 477 Main St., East Orange 2, N. J.

PRECISION DRESSING TOOLS

The *Nichols Miller*
Now Uses ZAGAR FIXTURES
as Standard Equipment



Ask for Bulletin "B"

—no doubt because they speed up so many different kinds of jobs **without special tooling.** Adapted to milling, drilling, tapping, grinding, slotting. Simple set-ups built around Zagar Holding and Indexing Fixtures jump production, give closer tolerances, slash costs.

ZAGAR TOOL, INC., 23882 Lakeland Blvd., Cleveland 17, Ohio

Zagar INDEXING AND HOLDING FIXTURES

SUSPENDED TOOLS AND EQUIPMENT

In various places, it has been found expedient to suspend tools, fixtures, or work, in order to make a specific operation more rapid or less fatiguing. This has been noticed in plants where there is much light assembly work, involving the driving of many small screws, or the running of small nuts, and where workers sit in chairs or on stools at assembly benches for this purpose.

In order to keep assembly benches clear, and to gain motion advantages, small electric or flexible shaft screwdrivers, nutrunners or similar tools are often suspended directly over assembly benches, in such manner that they are brought to the work with the very least effort. When released, they return by spring or counterweight action, to a point just above the work. This speeds such jobs materially.

Very heavy portable tools, such as large portable drills, and powerful nut setters, may be suspended from jib cranes fitted with hoists or chain blocks. An extension spring may be arranged in the suspension line to allow a certain amount of flexibility for any given height setting.

Large squeeze riveters of hydraulic or pneumatic type may also be handled in this way. Jigs and fixtures holding various kinds of work may be suspended in like manner.

Certain manufacturers of heavy portable tools have developed so-called balancers, which will support weight of any portable tool in a suspended layout. Balancers in sizes which provide balancing capacity all the way from three to 400 lbs are available. These permit balancing any type of portable tool, jig or fixture, in its best working position, above bench or assembly line. They eliminate much operator fatigue where they are used.

Another manufacturer of portable tools has gone even further, in the development of a tool suspension mechanism that not only supports the weight of the tool handled, but also absorbs the torque set up by heavy drills, nut runners, etc.

Center Scope Accuracy Solves Locating Problems!



It was used in making the initial setup of this job on a die sinking machine.

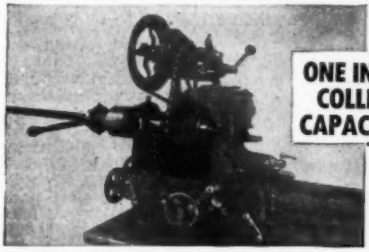
During the machining operations, the Center Scope was again used to check dimensions that were inaccessible to mechanical measuring instruments.

This illustration is but one of many examples of the use of the Center Scope in locating and measuring to a .0001" accuracy.

Send — today — for complete information. Just write Dept. C. S. 1 for complete details.

1000 PC

KEARNEY & TRECKER PRODUCTS CORPORATION
MILWAUKEE 14, WISCONSIN



ONE INCH COLLET CAPACITY

Convert Your ATLAS or LOGAN LATHE for Hand Screw Machine Operation with the . . . RECOR HEADSTOCK AND COLLET CLOSER

The hardened and ground spindle is mounted on Timken Tapered Bearings. Collet sets right into spindle, eliminating need of an intermediate sleeve.

Collet closer parts are hardened and ground where necessary. They are precision machined. Materials are of exact specifications required for maximum performance and life.

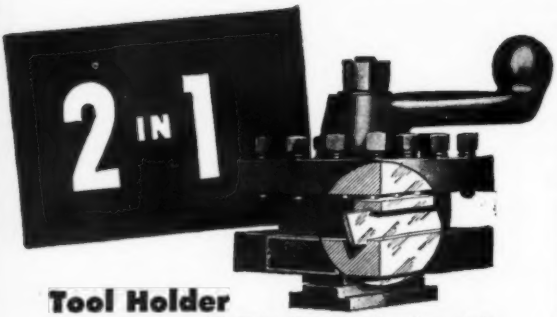
All holes in Headstock are drilled and tapped ready for mounting. Backgears on Headstock are eliminated. A gear is mounted on spindle permitting use of the screw feed for cutting, threading operations, etc. Speed variation is provided by a three step pulley mounted on spindle.

Recor equipment will pay for itself many times over in increased lathe production. Permits feeding and releasing of bar stock from 1/8" to 1" inclusive through the collet without stopping lathe. Gripping action is adjustable to desired tension without loss of time.

See your dealer or write to us for literature.

Manufactured by

RECOR MANUFACTURING COMPANY 430 SO. GREEN STREET CHICAGO 7, ILLINOIS



Tool Holder and Cut-off Bit included with the Crozier Tool Post Turret at NO ADDITIONAL CHARGE!

Standard equipment with the accurate, high quality Crozier Tool Post Turret now is a specially designed holder and a high speed steel cut-off bit—at *no extra charge!* Not only is this exclusive feature (Patent Applied For) an immediate money-saver, it also increases production, provides more rigid tool support and reduces set-up time. The Crozier Tool Post Turret, the first to be made for bench lathes, retains its normal advantages of fast, close indexing, dependable accuracy and long life which have made it so popular. It is available for Small, Medium and Big lathes—with cut-off holder and bit *without additional cost, remember.* Write for details.

Crozier

CROZIER MACHINE TOOL CO., PRAIRIE AT 118th ST., HAWTHORNE, CALIF.

Successors to C-W-C Corporation

See Crozier Products at National Metal Congress, Cleveland, October 16th to 20th

HANDLING WIRE COILS

Efficient methods for handling of wire coils are of great importance in the wire mill, for there such coils must be handled in large quantities.

A special type of truck known as a wire buggy is often found around the wire mill, and may be obtained from different builders. Such buggies have a bottom of concave type, so that wire coils can be set into them in a longitudinal row, in such manner that they can be picked up readily by other types of handling apparatus, and yet have no tendency to roll off the carrier. The buggies are equipped with four wheels so they can be pushed from one point to another.

It is worthy of notice, however, that some wire mills have installed special monorail layouts, or travelling cranes, equipped with special wire buggy grabs. These grabs pick up buggies loaded with wire, and transport them to any desired points, with far greater ease than they could be moved by hand. Grabs of this kind may be adapted for any style of truck or buggy, and are suspended from twin-hook hoists.

Coils of wire that are to be annealed are frequently carried thru the furnace on an overhead type conveyor, equipped with a traveling chain from which special hooks are suspended, designed to hold the coils. The speed of the conveyor being held uniform, an even job of annealing is obtained on all wire passing thru the furnace.

In some cases, wire is shipped from the mill to the consumer in open-topped or gondola railway cars. Different methods may be used for leading and unloading.

A boom-type crane has been employed for loading, being equipped with a hook suitable for handling the coils. Hooks may be made large and very strong, so that a number of coils may be picked up and transferred at one pass of crane boom

A relatively small but quite powerful crane has been made integral with an industrial truck, and used for handling coils of wire by crane. One of these, fitted with a large hook; can either lift and swing, or lift, transport and swing.

Presenting

A SUPER

DIAMOND WHEEL

CUTS MUCH FASTER — LASTS MUCH LONGER

Diamond Tools & Wheels To Your Specifications

SEND US YOUR PROBLEMS



Free Engineering Service

DIAMOND WHEEL INDUSTRIES, INC.

57 E. JACKSON BLVD. **CHICAGO 4, ILL.**

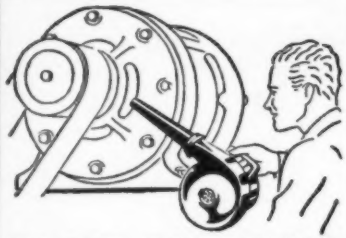


JANETTE SPEED REDUCERS

Your SLOW SPEED machines of from ***.08 r.p.m.*** and higher, ***1/50 to 10 H. P.,*** can be driven without using belts, pulleys, line shafts, chains, sprockets or slide rails, if you use one of the ***47 types*** of Janette speed reducers.

WRITE for our 100-page Catalog TODAY.

Janette Manufacturing Co
556-558 W. Monroe St.
Chicago, Ill.



BLOW OUT DUST with TORNADO

BLOW out harmful dust, dirt, lint, etc. with the TORNADO Portable Electric Blower. Prolong motor life. Prevent burnouts. Reduce replacements and fire hazards. Soon saves cost. Investigate.

Write for details and FREE TRIAL Offer

BREUER ELECTRIC MFG. CO.
5118 N. Ravenswood Ave., Chicago 40, Ill.

TORNADO
PORTABLE ELECTRIC BLOWER

WHITNEY-JENSEN PRODUCTS
10 YEARS EXPERIENCE

18" PRESS BRAKE



Specially designed to meet the need for a small power - driven press brake for moderate-sized work. Capacity, 14 ga. iron, 47 strokes per minute. Ram and die shoes machined for standard ½" tongues. Powerful, extremely sturdy, fast, easy to adjust, accurate, with many practical features.

Write for new Whitney-JENSEN AIRCRAFT TOOLS CATALOG

WHITNEY METAL TOOL COMPANY
115 FORBES ST. • ROCKFORD, ILL.

MATTHEW Patented
ROTARY TOOL CARRIER

is indispensable for finishing a complete multiple contour or irregular shaped milling job in ONE setting without use of Rotary table.

Capacity up to 7" diameter circle. Will fit any horizontal milling machine or can supply a suitable machine if required. Spindle speeds, standard 600 to 2800 R.P.M.

Rated capacity 1" end mills in steel.

Highly recommended for Metal Pattern, Molds of all kinds, Die Cast Dies, etc.

A quick self liquidating capital investment.

Descriptive matter on request.



PRODUCTION MACHINERY DEVELOPMENT COMPANY
4845 St. Aubin St., Detroit 7, Michigan

Will Not Mar Metal or Plated Finishes —

The New

PYRALIN TIPPED MALLETS

The only Pyralin Mallet on the market with threaded tips replaceable by hand. Plastic tips are quickly and easily screwed into the solid "non-sparking, non-magnetic alloy heads" when replacements become necessary.



These handy shop tools take the place of rawhide, wood and copper mallets — and do a better job. Oval hole drilled in head prevents handle from turning or coming off. Widely used in aircraft and war industries. *Let us send bulletin giving sizes and full information.*

SOUTHWEST MFG. CO.

1615 EAST FIRST ST. - Dept. B-10 SANTA ANA, CALIF.

P. O. BOX 776

NICHOLSON *E-x-p-a-n-d-i-n-g* MANDRELS

Solve the Problem of Handling a Maximum of Bores with a Minimum of Mandrels . . . . .



TYPE B—STRAIGHT JAW DESIGN

TYPE A STEP JAW DESIGN

Size No.	Range of Bores Taken	Net Price
1A	½" to 1"	$12.00
2A	1" to 1½"	16.00
3A	1½" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00



TYPE A MANDRELS are recommended for a large range of bores with few mandrels. Only five mandrels, each with one set of three jaws, hold work with all bores from ½" to 4". No. 1A has jaws with three steps, larger size have jaws with two steps. Can be used in hexagonal broached holes as well as round.

Size No.	Range of Bores Taken	Net Price
1X	½" to 21/32"	$10.00
2X	21/32" to 11/16"	11.00
3X	11/16" to ¾"	12.00
00	¾" to 7/8"	14.00
0	7/8" to 1"	16.00
1	1" to 1½"	18.00
2	1½" to 1 13/16"	21.00
3	1 13/16" to 2"	29.00
4	2" to 2½"	40.00

Other Sizes Taking up to 7" Bores.

TYPE B MANDRELS have longer jaw gripping surface, and accommodate longer, heavier work. 14 sizes will accommodate all bores from ½" to 7". The smaller sizes require only one set of jaws, intermediate sizes two sets, and larger sizes three sets. Each set consists of four jaws. For square holes as well as round. *Write for Bulletin 1043*

W. H. NICHOLSON & CO., 117 Oregon St., Wilkes-Barre, Pa.



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{3}{16}$" to 1" diameters. *Send for price list.*

HEIMANN MFG. CO.
332 Lincoln Ave. Urbana, Ohio

SEND US YOUR PRINTS FOR *Quotations*

THREAD GRINDING

Also Internal, External and surface grinding.

BROACHING
SCREW MACHINE PRODUCTS
MAGNETIC INSPECTION

● GEARS ●

SPUR WORM
BEVEL HELICAL

TAYLOR MACHINE COMPANY
MANUFACTURERS OF
AVIATION & AUTOMOTIVE PARTS
Gear Specialists
1937 EAST 61st ST. • CLEVELAND 3, OHIO

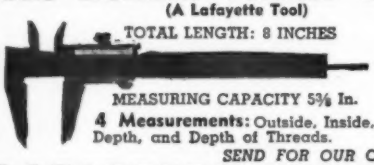
GET BIG PRODUCTION FROM UNSKILLED WORKERS!
Every dollar invested in
BOICE-CRANE
Safety-Engineered, Precision-Built, Shop-Tested
POWER TOOLS
does the work of two spent on oversize machines
You can get QUICK DELIVERY from Boice-Crane
BOICE-CRANE COMPANY
936 Central Ave. Toledo, Ohio
Write for free 48-page catalog
BAND SAWS • DRILL PRESSES
SPINDLE SHAPERS • SPINDLE SANDERS

Canadian Sales and Service Organization with wide technical knowledge interested in obtaining exclusive line of equipment or manufactured items where complete service facilities are essential. Reply giving full particulars.

Box No. B-22
c/o **HITCHCOCK PUBLISHING CO.**
542 S. Dearborn St., Chicago 5, Ill.

The Bendix Vernier Caliper

(A Lafayette Tool)



TOTAL LENGTH: 8 INCHES

MEASURING CAPACITY 5¾ In.

4 Measurements: Outside, Inside, Depth, and Depth of Threads.

SCALES:
1/16 with Vernier: 1/128 in.
.025 in. with Vernier: 1/1000 in.

Net Price $10.75

HARDENED MODEL
Net Price $16.00

SEND FOR OUR CATALOGUE.

LAFAYETTE TOOL & SUPPLY CO.
128 LAFAYETTE ST. NEW YORK, N. Y.

IMMEDIATE DELIVERY FROM STOCK
ON STANDARD SIZES

HIGH SPEED — PRECISION
CENTER DRILLS



Attention!

ALL SCREW MACHINE HOUSES

Here is just what you have been looking for. A High Speed, accurate Center Drill that guarantees a perfect center every time.

No longer is it necessary for you to cut down one of your drills for centering purposes. These tools are designed to give long and dependable performance.

SINGLE END—RIGHT AND LEFT HAND AVAILABLE

★

Satisfaction assured on a complete stock of all types of standard cutting tools and end mills.

Prompt Delivery on Special Tools, Dies, Jigs and Fixtures Made to Your Exacting Requirements.

★

Write for prices on standard sizes or submit blueprints for special sizes.

Galter Manufacturing Co.
711 W. Lake Street - Chicago, Ill.

Johnson
Furnaces

2300° F. in 30 MINUTES with No. 120 High-Speed Steel Heat-Treating Furnace

●

1500° F. in 5 Minutes

●



A low cost Unit that is unexcelled for heat-treating high speed steels, for hardening dies, punches and tools. Firebox is 5" high, 7¾" wide, 13½" long. Heavily lined throughout with insulating refractory. Equipped with Carbofrax hearth, G.E. motor and Johnson blower. Temperatures easily regulated.

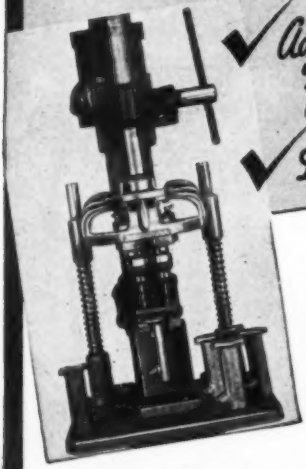
$129.50
F.O.B. FACTORY

FREE New Johnson Catalog. Write for yours today on coupon.

JOHNSON GAS APPLIANCE CO.
620 E. Ave. N.W., Cedar Rapids, Iowa
Name .....
Address .....
City ..... State .....

TWO SPINDLE *Adjustable* DRILL HEADS

Drill Two Holes At Once



✓ *Adjustable Centers from ½" to 6"*

✓ *Drill Capacity 0 to 5/8"*

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin.

LINDERME MACHINE & TOOL CO., INC.

12253 Coyle Ave., Detroit 27, Mich.

has a bed measuring 106x160", and is provided with a 37" stroke. Operation of the unit is controlled by means of pushbuttons.

That type of forming which is used in production of lineal work like metal moldings is very interesting, and differs altogether from ordinary press forming.

We think of the sheet-metal brake as being adaptable for forming within limits, but possibly are not familiar with the universal-brake variety of rounding and box-type forming machine, capable of handling light plate.

These machines are used for forming boxes, cases, rectangular tanks, and like work, from a single sheet of material. Chutes and troughs are made with them, also trays and boxes with high sides. Perfect tubes and pipe are produced, either straight or tapered, as well as a variety of large metal moldings for a number of uses.

For the production of moldings, tubing and other shapes from lighter metals, and in smaller sections, a different type of machine is preferable. The unit often used is known as a roll-forming machine. Strip or sheet brass, copper, aluminum, zinc, stainless steel or ordinary steels can be run into machines of this kind. The workpieces pass progressively thru a series of roll units, and different machines are made with different numbers of roll units, as required by work to be formed. In some cases, machines are set up for two jobs at a time.

FORMING OPERATIONS

Speak of the forming of sheet metal or plate, and our minds go immediately to forming presses, and to dies used in connection with them. It is true that here there is a greater variety and scope of formed work produced than on any other kind of machinery or equipment, and the consideration of such work will call up many associations.

Some of the larger work that is formed in this way is very interesting. Hydraulic presses of tremendous power, capable of forming bathtubs and work of similar size, are noted in operation. One such



"HERE, ROSIE, THE RIVETER,

is one of the reasons you can do your job so well"

Scotch tape holds a row of rivets in place for you, doesn't it, Rosie . . . multiplies production on your vital job? And there are thousands of war or civilian uses for such tape. Obviously, production mustn't be interrupted.

That's where Bowser Exact Liquid Control comes in. One of America's largest producers uses Bowser Meters to measure precisely the various ingredients of the adhesive and also the flow of adhesive on the backing materials. Then rust in the solvent caused backing sheets to tear. Frequent costly shutdowns were licked by a Bowser Filter. In other departments, Bowser Lubrication and Filtration units, Fuel Oil Meters, etc., are doing work that couldn't be done as well, if at all, by any other method.

Somewhere in your plant there is a job that can be done better by a Bowser Meter, Filter, Proportioner, Lubrication System, Oil Conditioner, Pump or one of the many other Bowser products. Write today. BOWSER, INC., Fort Wayne 2, Indiana.





BOWSER

Not only has Bowser's war production earned the Army-Navy E . . . Bowser equipment has helped earn it for scores of other companies.

BUY WAR BONDS

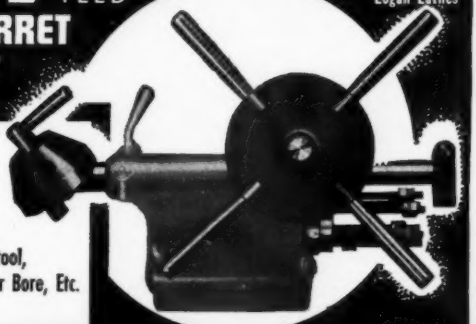
THE NAME THAT MEANS EXACT CONTROL OF LIQUIDS

for SPEED and EFFICIENCY

USE **UNIQUE** HAND FEED

TAIL STOCK TURRET ATTACHMENT

For 9-inch South Bend, Atlas, Clausing or Logan Lathes



- Can Be Installed In 5 Minutes.
- 6 Tool and Stop Positions.
- Longitudinal Travel, 3-Inch.
- Sturdy Gear & Rack Movement.
- Center-drill, Ream, Drill, Box-tool, Chamfer, Thread, Tap, Counter Bore, Etc.

OTHER "UNIQUE" ATTACHMENTS FOR SMALL LATHES!

Ask Your Dealer or Write Direct To

UNIQUE MANUFACTURING COMPANY

4807 N. 31ST AVE. OMAHA 11, NEBR.



Accelerating **WAR PRODUCTION**

Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.



CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

BRIDGE CRANES

A more docile and versatile beast of burden than the bridge crane is difficult to find around the average plant making heavy metal products. Some of the bridge cranes in use have tremendous capacities. For this very reason, we think of large cranes when we think of bridge cranes.

It must not be forgotten, however, that there are many relatively light bridge cranes of the monorail type. One builder of monorail systems and related equipment has bridge cranes of one- and two-ton sizes, furnished in both ordinary and electrified models. Such find many uses. They are used in handling of dies, in large die repair shops, handling and piling sheet steel into storage, handling coiled wire and coils of strip steel, stripping coils of wire from drawing benches in the wire mill, and performing various other duties.

Bridge cranes which are equipped with magnets for handling of ferrous materials must of necessity have electric cables, extending sufficiently far as to follow the magnets down to the lowest points of travel on the pickups. Unless some means is provided for taking these cables up automatically, when the magnets are lifted with the hoists, the cables will hang downward in loops. In this position, it is likely to foul on high obstructions, and cause trouble.

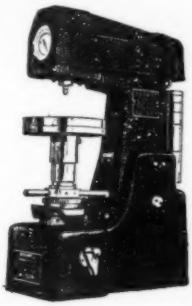
In order to avoid this, most of the modern installations incorporate automatic take-up reefs for the cables. The cables automatically pay out as far as necessary when the magnets are lowered; they also automatically are taken up by the reels when the magnets are lifted.

Large bridge cranes, fitted with flanged wheels running on rails at both ends of the spans, are usually judged by the private users, with regard to the actual mileage they will deliver in service. The use of high-quality wheels is very important on bridge cranes.

Most builders of cranes of this type do not make their own wheels, but turn to a steel specialties company.

"ROCKWELL"
HARDNESS TESTER

NEW MODELS!



QUICK DELIVERY

Made only by

383 Concord Ave. N.Y. 54, N.Y.

WILSON MECHANICAL INSTRUMENT CO. INC

An Associate Company of American Chain & Cable Company, Inc.

For WAR and POST-WAR PRODUCTION . . .



GRANT

assures the utmost in RIVETING ECONOMY

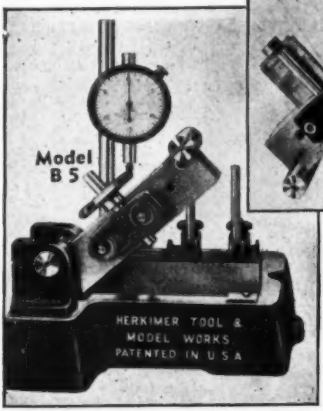


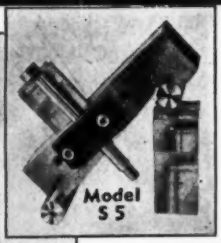
These GRANT Riveters are available in Noiseless Spinning and Vibrating Hammer types. Also Vertical and Horizontal Multiple Spindle Spinning Machines.

Information? Write!

THE GRANT MFG. & MACHINE CO. C E Sts., Bridgeport 5, Conn.

Simplified BEVEL GEAR GAUGING





No Difficult Operations, Involved Calculations or Intricate Manipulations.

With one set-up on these tools, any operator with ordinary gauging experience and a knowledge of blue print reading, can perform these three important operations:

1. **Check dimensional accuracy of the addendum cone (gear face) as related to thrust face of hub.**
2. **Check accuracy of cone angle.**
3. **Check run-out of gear face.**

Write for descriptive folder.

HERKIMER TOOL & MODEL WORKS, 1010 George St., Herkimer, N. Y.

★ ★ ★ ★ ★

50,000 RPM
For Faster
Better Work



USED IN HAND OR HOLDER



The Onsrud MD-1 Grinder gives ¼" to ½" grinding wheels the surface speeds at which they work best. This means more, better and faster work. Its cool-running air turbine motor develops ¼ HP at 50,000 RPM and cannot be damaged by accidental stalling or overloading. Automatic spindle lubrication keeps the MD-1 running almost indefinitely without heat, noise or vibration.

The MD-1 is amazingly easy and efficient to operate. Get all the facts. Send for special "Air Turbine Portable Grinder" bulletin today.

ONSRUD MACHINE WORKS, INC.
3908 Palmer Street Chicago, Illinois

Onsrud
AIR TURBINE and HIGH CYCLE
TOOLS and MACHINES
Routing - Drilling - Shaping - Grinding - Milling

SPRINGS

Plants which use only a moderate number of springs, and are not able to forecast just what their spring requirements will be for a very long time ahead, find it convenient to use hand-operated spring winders. Some consider these tools as applicable only to winding springs from small-diameter wire, but they are actually in use in different sizes. Usually a tool for winding small-diameter wire fills the needs of most shops.

One excellent tool of this kind is available in three sizes or capacities, all of which start at 0. One will wind springs from wire in sizes up to 3/32"; another will handle wire thru 3/16" dia., and the largest will take care of wire as large as 5/16".

Extension springs, compression or torsion springs, and specials like taper, double taper or left hand springs, are all successfully wound on units of this kind.

Some kinds of springs are highly special, and plants using these will in many cases obtain them from specialists in spring making.

Take the type of compression spring known as a barrel spring, as a case in point. The convolutions of such a spring increase in diameter as the spiral is wound, until the center of the spring length is reached. From there on they progressively decrease in diameter until at the end of the winding, they have the same diameter as at the beginning. The spring thus has something of the shape of a barrel being swelled out in the center. The advantage is, that when such a spring is fully compressed, the convolutions rest or nest one within the other, so that it has a large deflection in comparison with a very small "solid" height.

This is valuable where space is limited in a mechanism, in relation to the travel required on a spring-actuated return. Springs of this kind, and many other specials, can be obtained from some who continually produce them.

Those using springs in large quantities, use full-sized spring-making machines.

★ THE ★ WONDER CUTTER



The lowest-priced wire and rod cutter on the market. The hardened cutters last indefinitely.

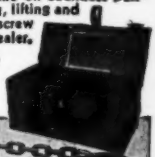
Hand operated. A giant for work, cuts wire and rods up to ⅝-in. round or ⅜-in. square and band iron up to ⅛ in. by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

Write today for prices and trial offer.

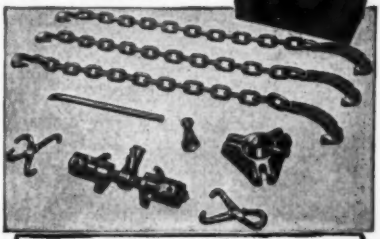
The Federal Foundry & Supply Co.
4602 East 71st St., Cleveland, Ohio

The Maintenance Man's Extra Arm

The Simplex Util-A-Tool saves time on countless pulling, pushing, spreading, clamping, lifting and straightening jobs. Also used as a screw jack, arbor press, etc. Ask your dealer.



Templeton, Kenly & Co.
Chicago (44), Ill.
Better, Safer Jacks Since 1899



Simplex
LEVER · SCREW · HYDRAULIC
Jacks

The CRITERION Carbide Tool *Grinder*

GREATER PRODUCTION CAPACITY

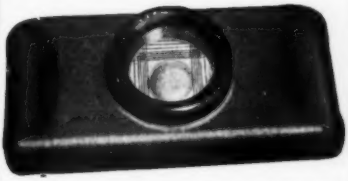


Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment. One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

CRITERION MACHINE WORKS
BEVERLY HILLS CALIFORNIA

FELL *PRECISION LEVEL*



A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes—5½"x12"; 3½"x6".

Write TODAY for bulletin giving full details.

Wm. B. FELL COMPANY
700 South St. Rockford, Ill.



Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

Send for Bulletin

American
DIAMOND TOOL & GAUGE CO.
15920 WOODINGHAM • DETROIT 21, MICH.

FIBER

There are many uses for vulcanized fiber, not only in connection with electrical items, where it is favored because of its insulating properties, but in various places where its use is purely mechanical.

Consequently, it is very often found being incorporated into metal products.

In cases where a number of standard fiber parts or shapes are desired, it is often the custom to obtain the parts already finished, from some firm that specializes in fiber. Such firms are usually equipped for sawing, drilling, tapping, and other operations on fiber, including punching of special shapes, and stamping of multiple hole pieces.

On the other hand, fiber manufacturing concerns provide the material in sheets, rods and tubes, and there are some cases where it is purchased in one or more of these forms, and worked out at the plant where the balance of the product is made. In such instances, it is well to know something about the best methods of working the material, for it presents problems that are peculiarly its own.

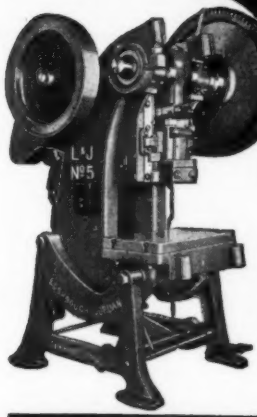
There are some cases in which it is helpful to do a little filing on some fiber piece or product, and in plants where this situation arises now and again, files especially adapted for this job are available.

Again, with regard to the rotary type of file, the tool that is used for fiber, as supplied by one maker of flexible shaft rotary filing machines, is a rasp, rather than a file. In plants where fiber is used in rods or in tubes, it is of course necessary to cut the material to the required lengths. This material, while cut in different ways, can be handled quite successfully with abrasive cutoff wheels, if the correct type of wheel is selected. At least one maker of such wheels is prepared to give recommendations along this line.

Another grinding wheel manufacturer has gone into the subject of surfacing fiber board with abrasive discs.

Standard Since 1911

L&J



INCLINABLE POWER PRESSES

5 to 79 tons

NO. 5 BACK GEARED TYPE

Write for catalog.

L & J PRESS CORP.
successors to Lobbouch-Jordan Tool & Machine Co.
1425 STERLING AVE. ELKHART, INDIANA

PRODUCTION ENGINEER

For well established, well equipped plant with young, progressive management and good post-war setup.

Product: Tools, such as wrenches, pliers, etc.

Must be thoroughly trained and have practical experience in jig and die design, plant layout, production control, time study, etc.

Located in city of 10,000 population, 75 miles from Minneapolis.

Permanent connection for right party.

Write

OWATONNA TOOL COMPANY
OWATONNA, MINNESOTA

SUPREME *Brand*
Hard Edge Flexible Back Metal Cutting
BAND SAWS



Have you been bothered with frequent band saw blade breakage, soft cutting edges, uneven set, or lack of proper temper?

If so, put an end to such trouble by using SUPREME METAL CUTTING BAND SAW BLADES.

Available in continuous bands for any machine or in coil form for radius or pattern cutting machines. All sizes permitted by WPB. When ordered in 100' lengths, coils are packed in handy containers.

Send for complete illustrated folder.

The Saw & Knife Specialty Co., Inc.
6523 Carnegie Ave., Cleveland 3, Ohio

NIELSEN
Heavy Duty
Live Centers

Write for catalog on live centers



Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

SIGOURNEY M-100

COMPLETELY ENCLOSED FOR OPERATOR SAFETY



In the Sigourney M-100 Drilling Machine all moving parts except the chuck and drill are completely enclosed for maximum safety in operation.

Ideal for fine precision drilling and maintained accuracy, the Sigourney M-100 has sealed ball bearings throughout . . . hardened and ground spindles . . . Standard Machine operates at speeds from 4,000 to 10,000 R.P.M.; other speed ranges available . . . manufactured in 1, 2, 3 and 4 spindle models.

Send for Illustrated Bulletin

THE SIGOURNEY TOOL CO.

Hartford 6, Conn.



Sole Sales Agents

PRATT & WHITNEY

Division Niles-Bement-Pond Co. . . . West Hartford, Connecticut

ROLLING MILL GAGES

Doubtless, there will always be a variety of rolling mill gages in use. The particular type found in any given place depends on the kind of work being produced, its requirements as to accuracy, and the personal preference of individual mill owner or operator.

Notched rolling mill gages, as used in many places for gaging hot and cold rolled sheet steel, have the advantage of quickly taking necessary measurements. They are usually made of hardened steel about ⅛" thick, and provide for checking sheet gages in all numbers from 000 to 25. Gages are usually U. S. Standard, but may also be obtained in English or Birmingham Standards.

Rolling mill caliper gages are preferred by some operators, and have the advantage of being adjustable to any odd measurement, as well as being suitable for heavy - thickness work.

One tool of this kind has jaws that are a little over 2" deep, making it possible to measure in from the edge of sheet or of plate for that distance. The jaws are hardened, and the tool is very strong, making it suitable for rigorous use. The jaws can be drawn as far as 4" apart, so the gage can be used anywhere between that point and zero. In addition to its use at the rolling mill, it is often used in stock and store rooms. The caliper slide can be locked in any position by means of a clamp nut, thus making it a rigid thickness gage of any desired size.

On rolling mills where sheet metal is being turned out in which a very high degree of accuracy is desirable, many prefer to use a micrometer caliper. The average micrometer tho does not have a sufficiently deep throat to allow of its application as far from the edge of the sheet as a measurement should be taken.

Consequently, some makers of micrometer calipers have developed deep-frame models, especially designed for the gaging of sheet metal. They have a range of 0 to 1", by thousandths of an inch, and will take a measurement 3" in from edge.

CONVERT
ANY MOTOR
into a
Flexible Shaft
Machine with an
ELLIOTT UNIT DRIVE

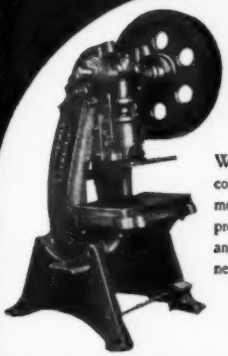


Elliott Unit Drives can be attached to any motor in your plant easily and quickly, and will give you efficient service at low cost. Unit Drives can be applied in hundreds of finishing operations or wherever constant power in a portable tool is needed. Many types of attachments can be used.

Investigate the advantages of the Elliott Unit Drive . . . write for Bulletin 44A giving complete information and prices.

ELLIOTT MANUFACTURING COMPANY
202 PROSPECT AVE BINGHAMTON N. Y.

RECLINABLE POWER PRESSES



We manufacture a complete line of mechanical power presses, with sizes and types for every need in your shop.

Write for bulletins.

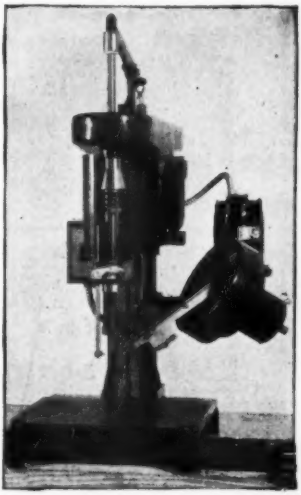
ZEH & HAHNEMANN CO.
Newark, (5) New Jersey

No. 2 To No. 6

Screws Driven on this Husky but Sensitive Hopper Feed Screwdriver.

No handling of screws. Just place assembly on table, move from screw hole to screw hole. The machine does the rest.

Drives screws at one second each.



DETROIT POWER SCREWDRIVER CO.
2809 West Fort St., Detroit 16, Mich.



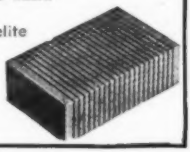
McMAHON'S *Magnetic Blocks*

V-100 Magnetic Block

30-45-60° Angle, with Brass Separators, Brazed in place. Size 2½"x2½"x3½" long. Priced $35.00 each.

K-125 Magnetic Parallels

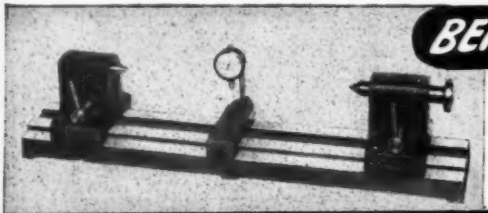
Sold in Sets of Two Blocks, with Bakelite Separators. Size, 1-3/32" x 2¼" x 4" long. Price, $12.00 per Set.



Write for Descriptive Literature.

FRANK McMAHON COMPANY

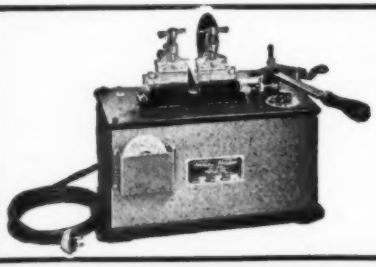
142 S. JUNE ST. DAYTON 3, OHIO



BENCH CENTERS

Removable Centers are tool steel, hardened and ground. Equipped with spring-type tail stock. Made in 6 inches diameter, 18 inches between centers.

MICHIGAN DRILL HEAD CO. 971 E. 8 MILE ROAD HAZEL PARK, MICH.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded. 220 and 110 Volt, 60 Cycle, single phase, 5 point heat control, 1 point anneal heat. Shipping weight 79 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC. 7325 McDONALD AVE. DETROIT, MICH.

OPEN THE WAY TO GREATER PROFITS

BY USING S & S HINGES

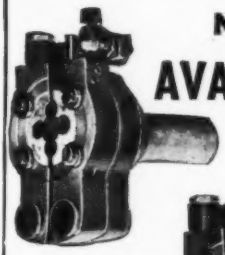
BUTTS AND CONTINUOUS LENGTHS — *for* GUARDS — CABINETS — CASES — BOXES — LUGGAGE

WRITE FOR CIRCULAR

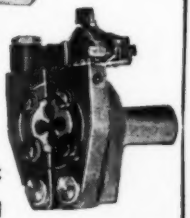
S & S MACHINE WORKS

HARDWARE DIVISION

4539 WEST LAKE STREET CHICAGO 24, ILLINOIS



NOW AVAILABLE



NEW

Fully Automatic
Easy Cleaning

DIE HEADS

Automatically opens at a predetermined length of thread.

Instantly withdrawn from stock without reversing machine.

Instantly set from a rough cut to a finish cut of thread.

Button dies quickly changed.

Less set-up time. Low cost.

Accurate speedy thread cutting is assured with these DIE HEADS. A wide range of capacity of each size die head means a small investment, and makes this modern DIE HEAD the ideal general purpose thread cutting tool. For tough threading jobs where constant uninterrupted operations are essential, the BHICO DIE HEAD will do them.

No fussy adjustments to be made; Dies removed by loosening of two screws.

In ordering BHICO DIE HEADS, specify DIE HEAD size and diameter of shank.

Ask your Dealer or order direct.

Write For Details, Circular C-1

B-H INSTRUMENT CO.

3321-23 AVENUE S BROOKLYN 10, N.Y.

KIPP *Air* GRINDER



$29.75 =

MODEL H

IF YOU ARE DOING PRIORITY WORK

Order Today!

Every toolmaker, every tool crib, every machine shop and thousands of production jobs need a model H Kipp Air Grinder. Because of expanded facilities the delivery position on high ratings has been measurably improved. Accessories in reasonable quantities can usually be shipped out of stock. Madison-Kipp Air Grinders were developed by practicing tool makers so they are practical. They usually pay for themselves on a single job.

MADISON-KIPP CORP.

257 Waubesa St., MADISON 4, WIS., U. S. A.

Minn-Kota TAP GRINDING TOOL

with Holding Fixture for Bench Grinder

This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.

MINN-KOTA MFG. CO., Dept. 904, Fargo, N.D.



Fixture adjustable to fit any bench grinder.

STANDARD D-4 Abrasive Band Grinder



This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW BOOKLET ON FINISHING—WRITE TODAY

WALLS SALES CORP.
96 Warren St., New York, N. Y.

Immediate Delivery FROM STOCK

GREAVES-SILENT BAKELITE GEARS



No waiting when you order Greaves Silent Bakelite Gears. • We have them in stock NOW! • Your order will go forward immediately. • You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. • You'll marvel at their great strength to carry big power loads . . . their remarkable ability to successfully operate completely submerged in water. • You'll welcome their low cost. • No metal reinforcements required. • Save Time . . . Money . . . Labor!

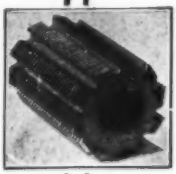


FOR GRINDERS CUTTING THEIR OWN GEARS, WE CAN MAKE IMMEDIATE DELIVERY ON BLANKS SAWED TO SPECIFIED DIAMETER AND FACE

We also make silent gears of rawhide and Fabriol.

Write for Circular.

Greaves MACHINE TOOL CO.
2013-7 Eastern Ave.
Cincinnati, Ohio



6 DAYS DELIVERY

FOR FIRST SHIPMENT ON ACCEPTED ORDERS

on

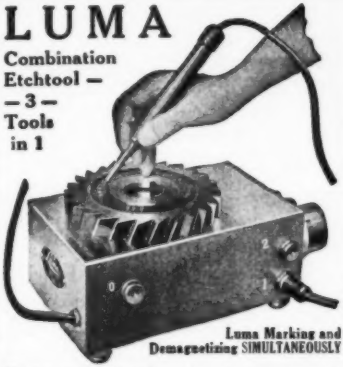
THREAD MILLING CUTTERS (HOBS)
EXPANSION- AND RADIAL RELIEVED FORM CUTTERS,
Regular or interrupted tooth form
CIRCULAR THREAD CHASERS
INVOLUTE SPUR GEAR CUTTERS—14½°; 20°; & 25° P.A.

Send Blueprints and Specifications

U. S. MACHINE TOOL MFG. CORP.
CLINTON, INDIANA PHONE 85

LUMA

Combination Etchtool — —3— Tools in 1

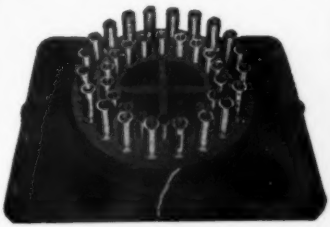


Luma Marking and Demagnetizing SIMULTANEOUSLY

Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

Send for details—5-day FREE TRIAL OFFER!

Luma Electric Equipment Co.
Dept. H P. O. Box 132, Toledo 1, Ohio



Pictured: a 38-Spindle Heavy-Duty Drill Head.

DESIGNERS AND MANUFACTURERS OF MULTIPLE DRILLING EQUIPMENT

We invite your inquiry.

MICHIGAN DRILL HEAD CO.
971 E. 8 MILE ROAD HAZEL PARK, MICH.

KEO CUTTERS

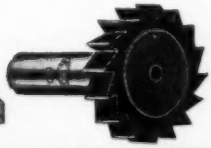


Cutters of proven quality. Standard sizes in stock for immediate shipment. Special cutters made to blue print specifications.

Write today for prices.

Few territories open.





KEO CUTTERS
19326 Woodward - Detroit 3 Mich.

HAMILTON
SWISS TYPE
GEAR HOBBERS

... for Accuracy and speed in hobbing PINIONS GEARS and SECTORS



TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to 2" diam.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" diam.

Write for further details to

TRIPLEX MACHINE TOOL CORP.
Sales Agents
125 Barclay St.
New York 7, N. Y.

Manufactured by
The Hamilton Tool Co.
Hamilton, Ohio



CRITERION
Boring Heads

Original Accuracy
Maintained

Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1¼" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

DIFFICULT DRILLING

In the main, difficult drilling jobs resolve themselves into two different types. One is the case where material being handled is difficult to drill. The other is where holes must be drilled in awkward, or hard-to-get-at places.

With particular regard to materials that are difficult to drill, the problem has often been solved by finding drills that are especially suited to the work.

In the case of drilling hardened steels, some have had recourse to localized annealing, but this is no longer necessary. Drills of special type are now in use that will penetrate hardened steels without trouble. Drilling, countersinking, counterboring and reaming of hardened steels are all being handled with tools of similar type.

There are many cases where use of an angle drill attachment will permit the drilling of small holes in difficult places. Such attachments are seen in use in connection with a portable electric drill. Other shops use a flexible shaft layout with angle drilling attachments. In either case, it is always evident that drilling is accomplished in places that would be very difficult of access with ordinary drilling tools.

Relatively heavy drilling in confined and tight places does not fall within the scope of these light-weight devices, however. For such purposes, the ratchet drill is used.

Some manufacturers have drills of this type in a considerable number of models. One is a very short ratchet drill, with a head length of only 2¾". It has a quick reverse mechanism, and is a perfect boiler repair ratchet.

Another tool is provided with a handle which swings on two trunnions. The two trunnions have common axes, but the trunnion axes are arranged at acute angles with the axes of the drills. This arrangement provides the drills with universal action. A bare two inches of motion at end of drill handle will suffice to turn the drill.



DIAMOND ACME TOOLS



Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.
15 MAIDEN LANE, NEW YORK, N. Y.

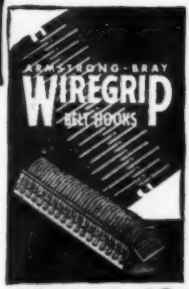


STEELGRIP BELT LACING

A strong lacing for all types of belts. Put on with a hammer in a few minutes. Clinches smoothly into belt, compresses ends, prevents fraying. 2-piece hinged rocker pins provided. 8 sizes. In boxes, handy packages, cartons and long lengths.
Write for catalog sheets.

BELT LACING
Both types from 1 source

BELT HOOKS come with blue aligning cards that prevent waste—every hook can be used. Protects fingers. Applied with a WIREGRIP or any other standard Belt Lacing Machine. 6 sizes.



ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
5364 Northwest Highway Chicago, U.S.A.

REED TYPE 50
VARIABLE SPEED
SENSITIVE DRILLS

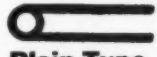


These safe, accurate, sturdy machines are available with any number of spindles. On multiple spindle units, a separate motor and drive is provided for each spindle.

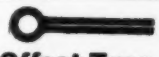
An infinite speed range of from 440 to 3,000 rpm is provided. Adjustment is instant and the speed is shown at all times on a speed indicator which is an integral part of the machine. The drill chuck itself is the only exposed moving part. This is an important point in shops employing women operators. Capacity is ¾"; spindle travel is 6"; adjustment of head is 6½".

Let us send bulletin giving full details.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.



TRADE AUTOM MARK



Plain Type — Offset Type

OPEN — OPEN

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

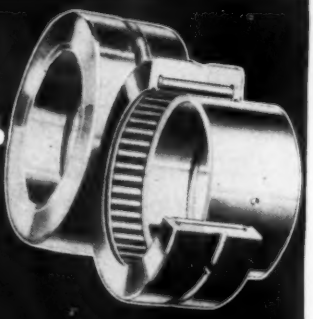


AUTO MOULDING & MFG. CO.
2326 S. CANAL ST
CHICAGO

SPECIFICATIONS:
Open Width 3/16° *to* 6°
Gage Material .040 *to* .125
Pin Diameter .101 *to* 3/16
Lengths to 120°



McGILL SOLIDEND MULTIROL BEARINGS



1. Rounded end rollers give greater load capacity.
2. No loose retaining rings—simplifies installation.
3. Provision for incidental thrust—an advantage.
4. Effective sealing—insures longer life—freedom from dirt.
5. Close tolerances—result, greater bearing efficiency.
6. Adequate lubrication facilities—reduces friction and wear.
7. No delicate parts to warp, break or lose—added convenience.
8. Great rigidity—eliminates vibration and noise.
9. Races and Rollers made from through-hardened high-carbon chrome steel.

Ask for Bulletin SM-42. This bearing has many features that make it extremely desirable for the majority of Industrial applications. Write "Bearing Division".

BEARING DIVISION—1700 North Lafayette Street
McGILL MANUFACTURING COMPANY, INC.
VALPARAISO, INDIANA

on skid-type units, suitable for handling with a power-type lift truck, have been deposited gently into core ovens, and as gently withdrawn, by trucks gasoline-powered, for 24-hour continuous service.

Where used, core oven platform skids and core oven trucks, do not have to be made up by some shop handy man, tho many shops make their own skids. Some manufacturers of materials handling equipment will provide both trucks and skids.

As for the core oven itself, there are a number of types in use, and most industrial oven manufacturers have worked out different core designs that are suitable for use in various types of establishments.

One gas fired oven for core baking, has an automatic control of temperature of the air, which is circulated and re-circulated in such manner as to provide a steady flow of cores, perfectly baked, in the shortest possible time.

The unit has three stationary drawers, and three hinged, removable drawers, which are 8' in diam. and have a capacity of 2000 lbs. of cores. Cores as high as 14" can be baked in this oven.

Large-capacity equipment often goes beyond this, however. One very large gas-fired core oven would dwarf many core ovens that are commonly seen. It is an oven of the car type, and will receive a 200-ton load of work and cars together. It is equipped with large swinging doors of panel type.

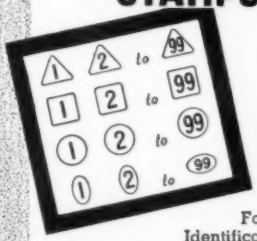
CORES

Factories having their own foundries, and handling a great deal of cast iron thru the machine shops, find it necessary to interest themselves in core baking ovens, as well as equipment that will handle the cores to advantage.

It is obvious that cores must be handled with at least a moderate degree of gentleness, to prevent breakage or crumbling.

In factories where engines are made, cores for the cylinder blocks are very important. Cases have been noted in which large loads of cores, mounted

New STEEL
INSPECTOR'S STAMPS



Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.
147 JOS. CAMPAU — DETROIT 7 U.S.A.

Automatic Metal Saw Grinder and Retoother
MODEL 1C



PRECISION and ACCURACY AUTOMATICALLY ASSURED

For metal cutting saws 2" to 14" in dia. When specified, saws as small as ¾" dia. and 1/32" to 2" spacing. Also supplied as a Combination Grinder for circular, band and hack saws.

WRITE FOR CIRCULAR

The Wardwell Mfg. Co.
3165 Fulton Rd. Cleveland 9, Ohio

WATER removed from AIRLINES AUTOMATICALLY WITH THE MURPHY SEPARATOR

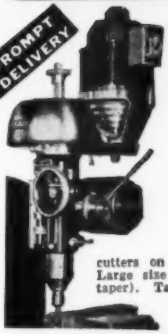
There is No Compressed Air Condition So Bad in Any Factory That We Cannot Correct and Completely Remedy.



Sizes ½" to 4" Pipe
Literature and Prices on request.
RESULTS — — — — GUARANTEED
NO ABSORBENTS — NO CHEMICALS
JAS. A. MURPHY & CO.
HAMILTON, OHIO

MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations

PROMPT DELIVERY

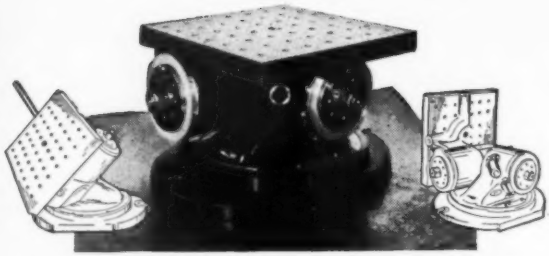


Easy Mounting
Large Quill — 4" travel
counter balanced, hardened, and ground
6 speeds
250 - 3000 RPM
Lever and Worm Feeds
½ H.P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes 1/16" to ¾" end mills. Precision Engineered and Ruggedly Constructed Throughout.

Write for descriptive folder.

RUSNOK TOOL WORKS
4840 North Avenue, Chicago, Ill.



Studler Universal *Compound* Angle Plate

Saves about 50% of time formerly consumed in set up of work. Can be used on milling machine, shaper, planer, jig borer, drill press, etc., to lay out, machine, and check work without removing work from plate. Can also be used as a 90° angle plate on the machine or on the bench.

The Studler Universal Compound Angle Plate holds work in any position from 0° to 90° in two planes 90° apart and in any position within 360° of the radial axis as the surface plate, from a parallel position to the base, may be tilted 90° in two directions and also rotated 360° on the base.

Calibration is accomplished thru use of two 5" and one 10" protractor, each graduated in half degrees, each with a vernier graduated to 1 minute and having an accuracy within 10 seconds of the arc. Each plane has its own locking unit so that the 11"x12"x1¼" surface plate may be moved in any plane, leaving the other two planes securely locked in place. Write for Bulletin No. 4.

THE ANGLE COMPUTER CO.

5722-20 Melrose Avenue • Los Angeles 38, California

STUDLER ANGLE COMPUTER

DRIVING SCREWS

Most of us are well acquainted with ordinary screw driving problems, and various kinds of hand screw drivers that are available. Mechanics know that screwdrivers with shock-proof handles are obtainable for electrical work, and that portable powered screwdrivers, both air-driven and electrically-driven, are found operating in various plants. These are especially useful on large assembly jobs, where it is so much more convenient to take the screwdriver to the work, than vice versa.

However, there are many kinds of work where it is better to drive the screws with a larger machine, taking work to the machine for that purpose.

Some of these machines are equipped with magazine feeds for the screws, and are power driven. Either wood screws or machine screws can be driven at a remarkably high rate of speed on units of this type. Special machines have been devised, which are provided with different kinds of work-holding fixtures for special types of jobs.

The use of a magazine - feed power screwdriver frequently solves the problem of driving very small screws, which are otherwise awkward to handle. One real production machine of this kind will drive screws all the way from No. 2x⅛ to No. 6 x¾. It will not mar the screw heads, and neither will it strip threads on machine screws. There are machines in the line, which will drive wood screws, machine screws of either the ordinary or self-tapping type, as well as capscrews.

Assembly costs are often cut materially thru use of machines of this kind.

An interesting proposition was noticed with regard to power screwdriving in one instance. In the shop where screws were being driven, there existed a distinct dust explosion hazard, and it was necessary to avoid use of an electrical motor, which might throw a spark. Accordingly, air controlled screwdrivers were built to take care of the work, using air cylinders etc.

BURKE

MILLING MACHINES

Make Fast Work of Small Jobs

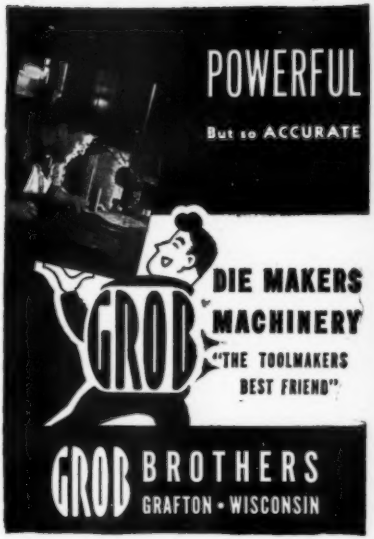
Motor Driven

Timken roller or ball bearings to spindle



Write today for circulars.

Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio



★ ★ ★ THE HILLIARD ★ ★ ★



Over-Running Clutch

A Free Wheeling Clutch of simple design recognized for many years as Standard Equipment for Automatic Dual Drive Operation—Automatic operation of 2 speed drive—As a ratchet permitting infinite adjustment and as an automatic backstop. Furnished in a number of types.

★ WRITE TO-DAY!

Giving full particulars of your requirements. Hilliard Engineers will tell you how to adapt this clutch to your needs.

THE HILLIARD CORPORATION
126 West Fourth St. Elmira, New York

★ CENTRIFUGAL SINGLE REVOLUTION FRICTION ★

600 ROOMS with BATH and RADIO



FROM $3.00

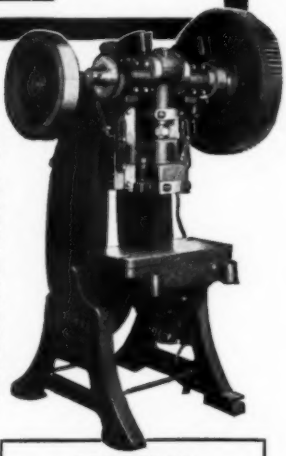
- Ideal Location
- Unlimited Parking
- Radio in Every Room
- Refurnished & Redecorated

HOTEL PHILADELPHIAN
DANIEL CRAWFORD, JR., Manager
39th & Chestnut Streets • Philadelphia

THIS STANDARD PRESS DOES SPECIAL JOBS

Before You Buy Expensive SPECIALIZED MACHINERY Investigate FEDERAL'S VERSATILITY

Standard Federal Presses are not only ruggedly built to stand up under hardest usage and give years of continuous service, but also are exceptionally versatile—capable of producing scores of special items which formerly would have required expensive specialized machinery. As a result, production speed is often increased as much as 3 to 6 times—and production costs cut to remarkably low figures. Take advantage of this versatility. Write for new catalog.



THE FEDERAL PRESS CO.
610 Division St., Elkhart, Ind.

FEDERAL
OPEN-BACK—INCLINABLE
PRESSES

FEATURES

Front Operated Recline • Timken Roller Bearing Flywheels • Frame-Anchored Knockout Bracket • Symmetrical Rams • Longer "V" Ways and Gibs • Oversize Crankshafts • Non-Repeat Clutch Mechanism • Safety Latch Spring

MACHINING PLASTICS

The general rule in machining of Bakelite, or of Synthane, a laminated product made with Bakelite phenolic adhesives, is to get plenty of speed on the machine tools.

This holds true for drilling, milling, boring or turning, or screw machine practice. Single-spindle automatic screw machines having a sufficiently high spindle speed to obtain a good job on this kind of work are now available.

Much interest has centered on the decorative possibilities of plastics, not only with regard to using them as decorations in their own right, but also in applying decorative touches to the plastics. One firm has developed a process for marking or engraving plastic articles in white, gold, silver and various colors. It is a development of the roll leaf method. Lettering or designs are easily applied, and are extremely durable.

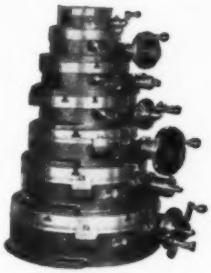
There is also a practical process available, by means of which metal inlays can be firmly embedded into Bakelite or any other type of plastic material. These inlays are placed into the product while cold, and consequently can be accurately placed, without any loss of time in the molding operation. Decorative motifs, names, initials, slogans and trademarks are all applied to flat or rounded surfaces, using gold, silver, stainless steel, chromium or any desired metal.

Some cutoff machines, used for cutting copper, aluminum, brass, etc., produce a very smooth cut in various machineable plastics. They use a blade made especially for the purpose.

A great deal of rod and tube stock in these materials calls for cutting to length before processing of any kind, inlay, engraving, threading or grinding, is begun.

Engraving on flat surfaces, or on surfaces of round or oval contour, is practiced, with the idea of afterward wiping in various colored pastes. Light bench type machines, suitable for this kind of work, are provided by some builders of engraving machinery. They are available in a number of sizes and are especially good for use with Bakelite.

TROYKE ROTARY TABLES



Sizes 9", 12", 15" and 18".
Ask your dealer or write us for eight page catalog.

ALFRED A. TROYKE
4422 Appleton St., Cincinnati, O.



The Standard of QUALITY

All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest *quality* and *service* at *attractive prices.*

Write today for prices. *Few Territories Open.*

QUALITY TOOL WORKS
Market St., Waukegan, Illinois

The COLBORNE Speed Lathes



SPEED UP FINAL OPERATIONS ON DIES . GEARS . SCREWS . LONG RODS

A recent addition to the COLBORNE line of Speed Lathes is the Series 30 machine. This speed lathe is indispensable for economical polishing, grinding, burring and lapping.

Very compactly constructed to do highest quality work with the COLBORNE features of spindle bearings running in oil, instant stopping brake, easy opening collet and standard speeds of 600-920-1720-3280-4800 RPM using ¾ H.P. motor and cone pulleys. Collets and chuck may be used.

For more production per day choose COLBORNE.

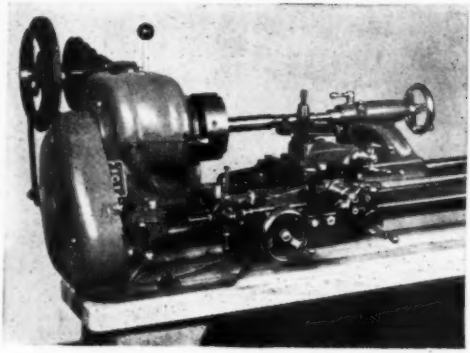
PROMPT DELIVERIES
Write for Details Today.



COLBORNE MFG. COMPANY
BUILDERS SINCE 1879
157 Division St. Chicago 10, Ill.

RAY FEED CONTROL

A new fast and accurate attachment, especially for Logan and Atlas Lathes has been developed by Independent Specialties, 152 W. 75th St., Chicago 21, Ill.



It automatically controls movement of the lathe carriage by operating the half-nuts mechanically, causing carriage to stop instantly at any predetermined point. The makers emphasize that it holds the work to very close limits, relieves the operator from strain resulting from constant measuring and close watching. No skill is required for successful operation.

It is said to effect savings of 50 per-cent in time alone on some work by making back-gearing unnecessary. It is claimed to eliminate spoiled work and tools making possible a steady universal movement of the tool from start to finish of the cut. Threading operations are made with a single tool set-up and cutting a groove in the work to relieve tool at end of thread is automatic. It is pointed out that boring, grinding, internal threading, or in fact any operation that may be done with power feed is faster and more accurately done than is possible with conventional hand feeding.

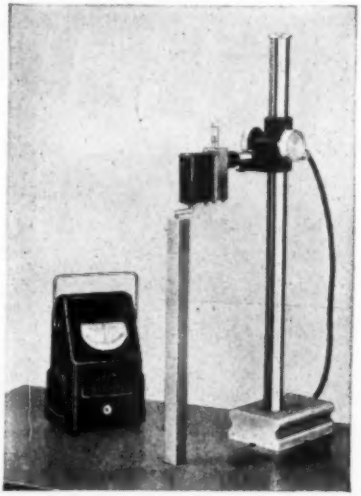
Installed within a few minutes, the attachment becomes a permanent part of the lathe and does not interfere with any of the other controls. Full information including instructions for installing and operating are given in bulletins that will be sent on request.

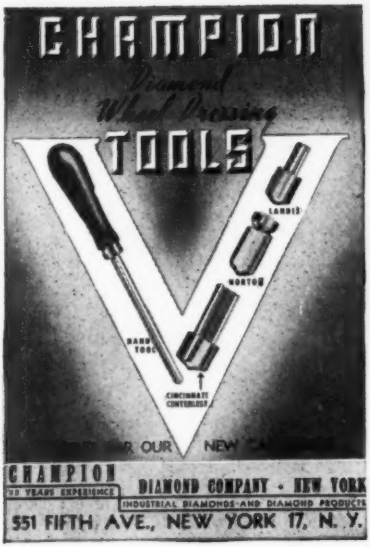
SHEFFIELD HEIGHT INDICATOR

A new type of Precision Height Indicator with Electrigage that gives a quick, positive and accurate reading is announced by the Sheffield Corp., Dayton, Ohio. It is designed for use on a surface plate, whether in the toolroom, in process, or where highly accurate inspection is required.

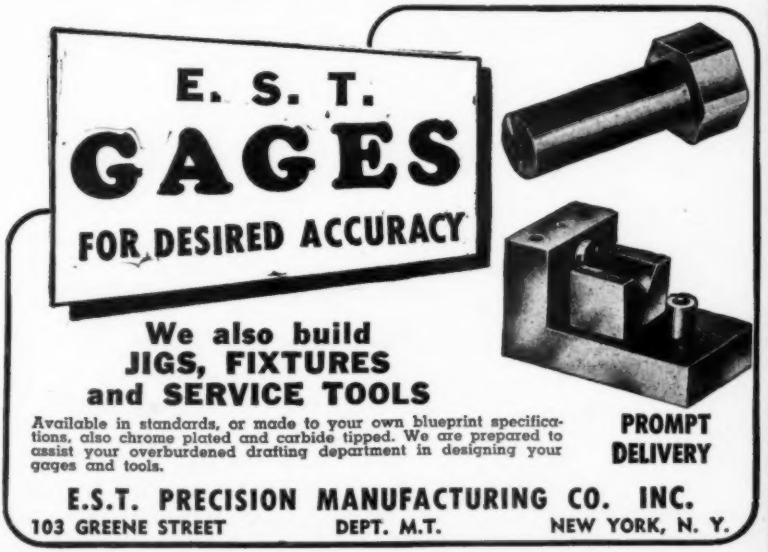
The instrument includes a surface plate block, a 26″ column with rack, and a Sheffield Electrigage, 1000-1 amplification, smallest graduation .0001″ with electric pickup head mounted on an adjustable extension arm. A micrometer is provided for 3/32″ vertical adjustment of pickup head, allowing the operator a much wider range of rough comparison measurements than is possible with the Electrigage alone.

The mounting bracket is adjustable vertically with a capacity of 0″ to 18″. The extension arm can be adjusted to bring the pickup head to any location, with a throat capacity—gaging point to edge of column, 4½″ to 11″, and gaging point to edge of base, 3½″ to 10″. The pickup head can be rotated and locked in position within a full range of 360°, while a fine adjustment knob facilitates the coarse and fine setting-up.

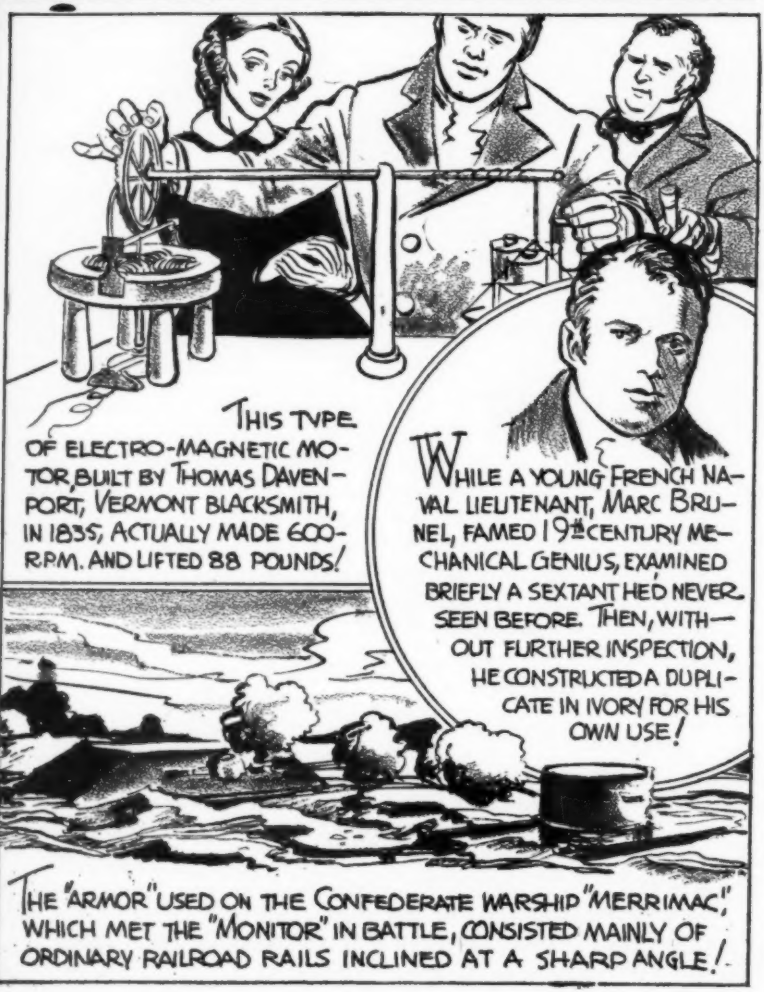



CHAMPION
Diamond
Wheel Dressing
TOOLS
LANDIS
NORTON
CINCINNATI CENTERLESS
CHAMPION
DIAMOND COMPANY - NEW YORK
INDUSTRIAL DIAMONDS AND DIAMOND PRODUCTS
551 FIFTH AVE., NEW YORK 17, N. Y.

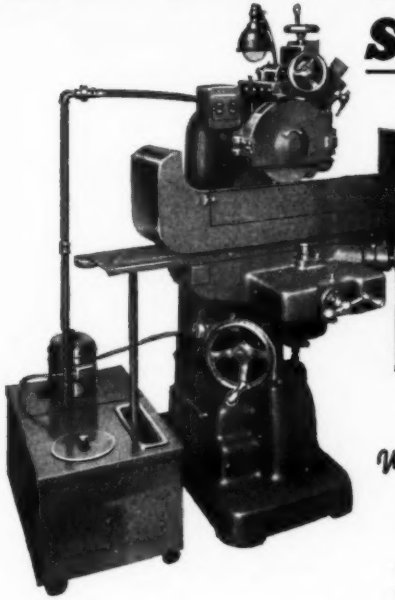

MADE OF ALLOY STEEL
MILLED FROM BAR
SOCKET HEAD
CAP SCREWS
ECONOMY
PRODUCTS
SAFETY HOLLOW
SET SCREWS
Try Them On Your Next Job!
ECONOMY
MACHINE PRODUCTS
COMPANY
5207 Lawrence Ave., Chicago, Ill.

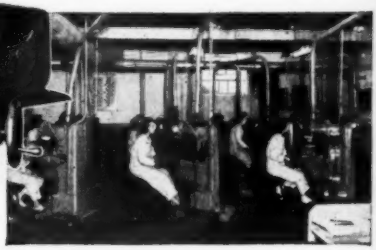

E. S. T.
GAGES
FOR DESIRED ACCURACY
We also build
JIGS, FIXTURES
and SERVICE TOOLS
Available in standards, or made to your own blueprint specifications, also chrome plated and carbide tipped. We are prepared to assist your overburdened drafting department in designing your gages and tools.
PROMPT
DELIVERY
E.S.T. PRECISION MANUFACTURING CO. INC.
103 GREENE STREET DEPT. M.T. NEW YORK, N. Y.

Mechanics Through the Ages



Even "Green" Operators are *Setting Records*





With COVEL NO. 15 SURFACE GRINDER (6" x 18")

CHECK THESE FEATURES

- ★ *Ball bearing spindle — dust-protected.*
- ★ *3-speed V-belt drive.*
- ★ *V and flat table ways.*
- ★ *Convenient controls.*
- ★ *Extra-large work table.*
- ★ *Ample knee-room for operator's comfort.*
- ★ *Built-in wheel truing device (optional).*
- ★ *Wet Grinding Attachment (optional).*

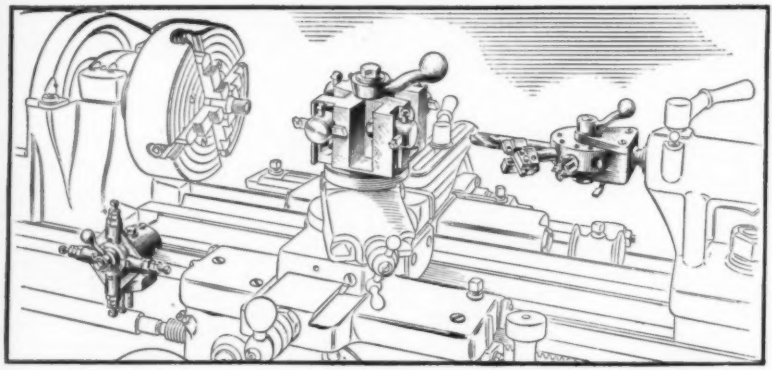
Ever since war industry's boom made it necessary to use almost any help available, hundreds of "green" operators (many of them women) have been setting enviable records with Covel No. 15 Hand Feed Surface Grinders. That's because this fast, precision machine is designed and built for easy, efficient work — and operators quickly acquire the "know-how." Equally important, work spoilage is cut to a minimum, for grinding wheel can't fall into the work. Spindle remains stationary, and work moves UP to the wheel. Its "quick set-up" feature also makes the No. 15 ideal for either production line or tool room. Write today for Bulletin MT-104.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

To convert engine lathes into turret lathes...



HERE'S ALL YOU NEED...

CROSS-SLIDE TURRET — for multiple machining operations on the same lathe. Gives you four different working positions without tool changes. No. 30 for 9" to 11" lathes; No. 60 for 12" to 18" lathes.

TAIL-STOCK TURRET—quickly converts engine lathe into 4-way turret lathe for end work. No. 58 with No. 2 Morse Taper Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse Taper Shank.

LATHE STOP—you measure only once for each operation, thus saving valuable time. Once the four measuring positions are set, you just index. No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes.

Write for further information.

SPECIALTIES MANUFACTURING CO., INC.
25 Farrand Street, Bloomfield, N. J.



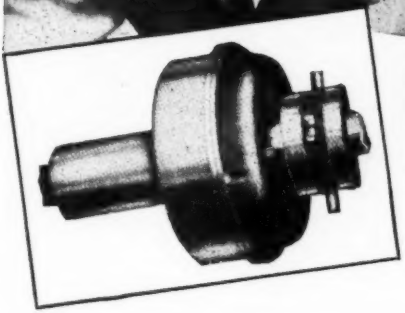
"YOUR CLUTCH WORRIES ARE OVER"

When You Install

HANSON

Friction Clutches

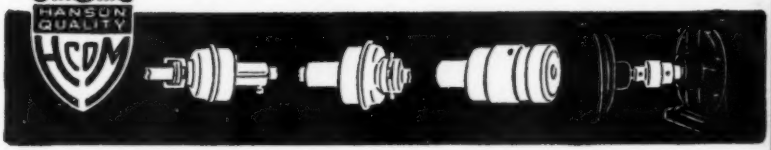
Clutch is constructed to do a specific job, and to do it with minimum of trouble and wear. Hanson Clutches consist of units to fit most any installation regardless of how severe the service, both as to load or speed of drive. There probably is a standard Hanson Clutch to fit your needs — if not, our engineers will help you with recommendations. Why not write us today?



Hanson Friction Clutch Type "C" was designed to fill the need of a low price coupling to operate at moderate speeds. Each and every Hanson

The **HANSON** **CLUTCH & MACHINERY CO.**

Box H44 TIFFIN, OHIO



KEYWAYS...10 TIMES FASTER

with



The GLENNY adjustable-expansion Push BROACH

MAINTAINS ± .0005 ACCURACY

Steel Bushing — Keyway cut 3/16" deep, 3/8" wide — in production quantities.



Glenny Broach on Arbor Press.

Broaches slots of greatest accuracy to an average length of four inches and up to 5/8" widths. May be used on Arbor Presses, Lathes, Screw Machines and other equipment.

10 TIMES FASTER THAN ORDINARY METHODS

The bushing illustrated above was slotted with a Glenny Broach in one-tenth of the time required by a shaper for the same operation. Full information in Bulletin 9. Send for it today.



Glenny Broach in series with tools for other operations on Turret Lathe.

SEND FOR BULLETIN 9

Address Dept. A

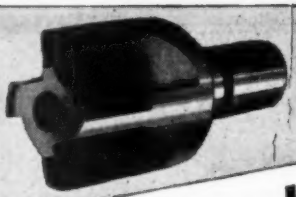


Patent No. 2,184,383

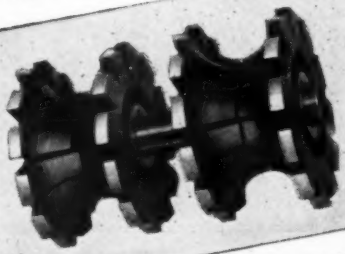
EAST SHORE MACHINE PRODUCTS CO.

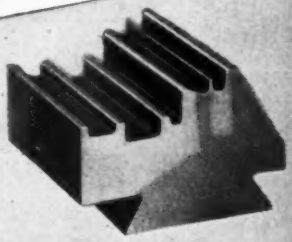
835 EAST 140th STREET

CLEVELAND 10, OHIO, U. S. A.



Carbide-Tipped, or Hi-Speed for Fast Cutting—Long Life





As the basis of your precision products your cutting tools must be accurate and long wearing or your entire production will suffer. We invite your inquiries on CARBIDE-TIPPED or HI-SPEED cutting tools and promise you prompt estimates and attractive deliveries. Write for new illustrated bulletin No. 301, showing some of the types of tools we manufacture.

AMERICAN CUTTER & ENGINEERING CORP.
31741 Mound Road • • Warren, Michigan

A.C.E. SPECIAL CUTTING TOOLS

PROMPT DELIVERIES

HIGH SPEED END MILLS

DOUBLE END



Two and Four Flutes

Dia. of Mill	Diameter of Shank	Length of Flute	Overall Length	Net Price
1/8	3/8	3/8	3	2.20
5/32	3/8	3/8	3	2.20
3/16	3/8	1/2	3	2.20
7/32	3/8	5/8	3 1/8	2.20
1/4	3/8	5/8	3 1/8	2.20
9/32	3/8	3/4	3 1/8	2.20
5/16	3/8	3/4	3 1/8	2.20
11/32	3/8	3/4	3 1/4	2.20
3/8	3/8	3/4	3 1/4	2.20
7/16	1/2	1	4 1/4	2.80
1/2	1/2	1	4 1/4	2.80
5/8	5/8	1 3/8	5	3.44
3/4	3/4	1 5/8	5 5/8	4.20
1	1	1 3/4	6 1/4	5.40

SINGLE END

Two and Four Flutes

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/8	3/8	3/8	2 5/16	1.40
3/16	3/8	1/2	2 3/8	1.40
1/4	3/8	5/8	2 1/2	1.40
5/16	3/8	3/4	2 1/2	1.40
3/8	3/8	3/4	2 1/2	1.40
7/16	1/2	1	2 1/16	1.76
1/2	1/2	1 1/4	3 1/4	1.88
5/8	5/8	1 5/8	3 3/4	2.40
3/4	3/4	1 5/8	3 3/4	2.52

LONG SINGLE END MILLS

Four Fluted

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/4	3/8	1 1/4	3 1/8	1.68
5/16	3/8	1 3/8	3 1/8	1.68
3/8	3/8	1 1/2	3 1/4	1.68
7/16	1/2	1 3/4	3 3/4	2.08
1/2	1/2	2	4	2.16
5/8	5/8	2 1/2	4 5/8	2.76
3/4	3/4	3	5 1/2	3.44

VICTOR MACHINERY EXCHANGE, INC.

251 Centre Street • New York, N. Y.

PROMPT DELIVERIES

NEW HIGH SPEED SIDE MILLING CUTTERS



Diameter Inches	Face Inches	Hole Inches	Our Net Price Each	Diameter Inches	Face Inches	Hole Inches	Our Net Price Each
2	3/16	½	$ 2.65	5	5/16	1	$ 9.00
2	¼	5/8	2.77	5	3/8	1	9.00
2	3/8	5/8	3.02	5	7/16	1	9.55
2½	¼	7/8	3.40	5	½	1	9.51
2½	5/16	7/8	3.59	5	5/8	1	10.52
2½	3/8	7/8	3.78	5	¾	1	11.46
2½	7/16	7/8	4.15	5	7/8	1	13.42
2½	½	7/8	4.15	5	1	1	13.42
3	3/16	1	4.10	6	3/16	1	11.00
3	¼	1	4.10	6	¼	1	11.00
3	5/16	1	4.35	6	5/16	1	11.00
3	3/8	1	4.54	6	3/8	1	11.00
3	7/16	1	4.79	6	7/16	1	11.00
3	½	1	5.04	6	½	1	12.41
4	3/16	1	5.67	6	5/8	1	13.92
4	¼	1	5.67	6	¾	1 or 1¼	15.12
4	5/16	1	6.36	6	7/8	1 or 1¼	17.89
4	3/8	1	6.36	6	1	1 or 1¼	17.89
4	7/16	1	7.12	7	½	1 or 1¼	18.00
4	½	1	7.12	7	5/8	1 or 1¼	18.00
4	9/16	1	7.75	7	¾	1 or 1¼	21.67
4	5/8	1	7.75	7	1	1 or 1¼	25.39
4	¾	1	8.38	8	½	1 or 1¼	25.00
4	7/8	1	9.00	8	5/8	1 or 1¼	25.00
5	3/16	1	9.00	8	¾	1 or 1¼	28.00
5	¼	1	9.00	8	1	1 or 1¼	33.64

VICTOR MACHINERY EXCHANGE, INC.

251 CENTRE STREET **NEW YORK, N. Y.**

Index to Advertisers

Abart Gear & Mch. Co. 256
Abrasive Company 59
Abrasive Dressing Tool Co. 69
Abrasive Machine Tool Company 309
Accurate Bushing Company 370
Ace Abrasive Laboratories 326
Ace Manufacturing Corp. 286
Acme Diamond Tool Co. 397
Acme Industrial Co. 144
Acme Tool Co. 98
Acme Wire & Iron Works 188
Acromark Co. 152
Acro Metal Stamping Co. 93
Aerco Corporation 27
Aget-Detroit Mfg. Co. 319
Aircraft Nut Corp. 301
Alco Tool Co. 326
Allison Tool & Engineering Co. 76
Almond Co., T. R. 216
Alofs Mfg. Co. 367
American Air Filter Co. 299
American Broach & Machine Co. 197
American Cutter & Engrg. Corp. 411
American Diamond Tool & Gauge Co. 388
American Photocopy Equipment Co. 348
American Society for Metals 89
Ames Co., B. C. 34
Anderson Bros. Mfg. Co. 341
Anderson & Quigley Co. 359
Angle Computer Company 400
Anker-Holth Mfg. Co. 315
Annis Co., R. B. 328
Apco Mossberg Co. 372
Apex Machine & Tool Co. 14
Archer & Smith, Ltd. 37
Armstrong-Blum Mfg. Co. Inside Front Cover
Armstrong Bray & Co. 397
Armstrong Bros. Tool Co. 4
Aro Equipment Corp. 85
Arrow Metal Products Co. 67
Atlantic Saw Mfg. Co. 181
Atlas Press Company 121
Automatic Machine & Tool Co. 150
Auto Moulding & Mfg. Co. 397
Avey Drilling Machine Co. 223

B-H Instrument Company 393
Baker Brothers, Inc. 268
Baldor Electric Co. 266
Baumbach Mfg. Co., E. A. 292
Bay State Abrasive Products Co. 137
Behr-Manning 68
Bellows Company 51
Berkeley Equipment Co. 30
Best Tools Corp. 45
Beverly Shear Mfg. Co. 353
Black Diamond Saw & Machine Co. 362
Blake Co., Edward 306
Blank & Buxton Machinery Co. 70-265
Bodine Corp. 245
Boggis & Co., Henry P. 373
Boice-Crane Co. 380
Bokum Tool Company 311
Bowser, Inc. 283
Boyar-Schultz Corp. 259
Brady Penrod Company 212
Bremil Mfg. Co. 294
Breuer Electric Company 378
Bridgeport Safety Emery Wheel Co. 329
Brown Corp., W. R. 317
Brown Engineering Co. 186-260
Brown & Sharpe Mfg. Co. 156
Buffalo Forge Co. 18
Burgess-Manning Co. 238
Burke Machine Tool Co. 401
Burr & Son, J. T. 304
Busch Co., J. C. 353

Cadillac Gage Company 86
Canedy-Otto Mfg. Co. 261
Capewell Manufacturing Co. 357
Carboloy Co., Inc. 219
Cardinal Machine Co. 278
Carroll & Jamieson Machine Tool Co. 152
Carter Products Co. 236
Center Tool Company 36
Central Mch. Works Co. 305
Central Tool Co. 183
Champion Diamond Company 405
Chandler Tool Company 228
Chicago Mfg. & Dist. Co. 79
Chicago Pneumatic Tool Co. 64
Chicago Screw Co. 90
Chicago Tool & Engineering Co. 288
Chicago Wheel & Mfg. Co. 194-195
Cincinnati Electrical Tool Co. 420
Cincinnati Grinders, Inc. 9
Cincinnati Milling Machines 8
Cincinnati Planer Co. 171
Cincinnati Shaper Co. 10
Cincinnati Tool Co. 370
Circular Tool Co. 52
Clark Equipment Co. 303
Clark Instrument, Inc. 56
Clark Jr. Electric Co., James 92
Clark Co., Robert H. 151-302
Cleveland Tool Engineering Co. 31
Cleveland Twist Drill Co. 71
Cleveland Twist Drill Co (Mo-Max Div.) 55
Colborne Mfg. Co. 403
Cone Automatic Machine Co. 41
Consolidated Mchy. & Supply Co., Ltd. 224
Continental Machines, Inc. 43
Conway Clutch Co. 291
Cooley Electric Mfg. Corp. 277
Coulter Machine Co., James 312
Covel Manufacturing Co. 407
Criterion Machine Works 384-387-396
Crozier Machine Tool Co. 376
Cullen-Friestedt Co. 341
Cullman Wheel Co. Back Cover

Dake Engine Company 87
Danly Machine Specialties 63
Darnell Corp., Ltd. 168
Dayton Rogers Mfg. Co. 294
Dearborn, J. W. 220
Deepfreeze (Motor Products Corp.) 213
Defiance Metal Products Co. 290
Desmond-Stephan Mfg. Co. 355
Detroit Power Screwdriver Co. 391
Detroit Stamping Co. 273
Diamond Wheel Industries 377
Dix Mfg. Co. 335
Dolge Co., C. B. 226
Douglas Machinery Co. 105
Dreis & Krump Mfg. Co. 53
Dremel Manufacturing Co. 139
Drive-All Mfg. Co. 196
Durant Mfg. Co. 331
Duro Metal Products Co. 22
Dykem Co. 318

E. S. T. Precision Mfg. Co. 405
E. Z. Manufacturing Co. 246
Eagle Tool & Mch. Co. 300
Eastern Machine & Tool Co. 330
Eastern Precision Gage Co. 218
East Shore Machine Products Co. 410
Economy Machine Products Co. 405
Eisler Engineering Co. 289
Electron Equipment Corp. 60
Elgin Tool Works 114-115
Elliott Manufacturing Co. 391
Elmes Engineering Works 49
Empire Tool Company 275
Enco Manufacturing Co. 46-47
Engineers' Specialties Div. 72
Enterprise Machine Parts Corp. 282
Equipment Mfg. Inc. 321
Erickson Steel Company 100-101
Errington Mechanical Laboratory 365
Ettco Tool Co. 227
Excelsior Tool & Machine Co. 359
Ex-Cell-O Corp. 169
Eutectic Welding Alloys Co. 32



"Tenths" Are Here to Stay

There are shops today working to tolerances of tenths of thousandths that formerly considered 1/1000" a close measurement. The precision demands of war have made these tolerances a commonplace.

For this reason, because 1/10000" is being called for more and more, REED micrometers in the 1", 2" and 3" sizes will now be manufactured with 1/10000" vernier only AT NO EXTRA CHARGE. Even now micrometers reading to "thousandths" are often inadequate and may well become obsolete.

If you are working with micrometers reading to 1/1000" only, this is your opportunity to order a REED No. 901, as shown above, with vernier to 1/10000" for only $8.50 less 10%. The price is low but the quality is high. REED MICROMETERS HAVE BEEN MADE IN THE U. S. A. CONTINUOUSLY FOR 30 YEARS.

We have just published an 8-page folder about REED micrometers that you should have. Every man who uses a "mike" will find it of interest.

Write or telephone for this folder NOW!



Fameo Machine Company....314
Federal Foundry & Supply Co....387
Federal Press Co....402
Federal Products Corp....217
Fell Co., Wm. B....387
Fellows Gear Shaper Co....185
Fenn Mfg. Co....323
Field Abrasive Specialty Co....292
Flexrock Company....244
Florian Manufacturing Company....190
Fonda Gage Company....374
Ford Manufacturing Co., M. A....143
Foredom Electric Company....106
Fulflo Specialties Co....94

Gallmeyer & Livingston Co....33
Galter Mfg. Co....381
Gay-Lee Company....96
General Die-Stamping-Tool Co....78
Genesee Manufacturing Co....122
Giddings & Lewis Mch. Tool Co....12-13
Gisholt Machine Co....11
Gits Brothers Mfg. Co....368
Glenzer Co., J. C....263
Gorton Machine Co., Geo....119
Graham Mfg. Company....339-350
Grand Rapids Die & Tool Co....254
Grant Mfg. & Machine Co....385
Great Lakes Broach & Gage Co....313
Greaves Machine Tool Co....394
Greenerd Arbor Press Co....347
Greenfield Tap & Die Corp....82
Greenlee Brothers & Co....187
Grob Brothers....401
Grobet File Co. of America....97-125
Gruen Gauge Company....208

Haines Gauge Company....182
Hall Mfg. Co....188
Hamilton Tool Co....157-178
Hammond Machinery Builders....419
Hansen Manufacturing Co....84
Hanson Clutch & Mchy. Co....409
Hardinge Brothers, Inc....Front Cover-3
Hartford Special Machinery Company....235
Harvey Mfg. Corp....361
Haskins Company, R. G....140-174
Hedstrom Corp., Oscar....337
Heimann Mfg. Co....380
Hendey Machine Co....205
Herkimer Tool & Model Works....385
Herman Stone Company....335
Heuser Manufacturing Co....318
Hilliard Corp....401
Hisey-Wolf Machine Co....281
Hobart Brothers Co....1
Hotel Philadelphian....401
Howe & Son, Inc....260

Ideal Com. Dresser Co....153
Independent Pneumatic Tool Co....6
Independent Specialties....362
Industrial Products Suppliers....325
Ingersoll Milling Machine Co....17

J. & S. Tool Co....361-373
Janette Mfg. Co....377
Jarvis Co., Chas. L....15
Jefferson Mach. Tool Co....327
Johnson Gas Appliance Co....381
Johnson Machine & Press Corp....365
Johnson Manufacturing Corp....16
Jones & Lamson Machine Co....7

Kalamazoo T. & S. Co....253
Kearney & Trecker Products Corp....163-375
Kempsmith Machine Company....25
Kennametal Inc....296
Keo Cutters....395
King Products....222
Knight Machry. Co., W. B....159

L. & J. Press Corp....389
L-W Chuck Co....193
Lafayette Tool & Supply Co....331-345-380

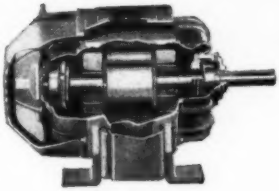
LaPointe Machine Tool Co....111
Leach Machinery Co., H....347
LeBlond Machine Tool Co., R. K....135
Lee Co., K. O....95
Lehmann Machine Co....35
Leiman Brothers, Inc....124
Lempco Products, Inc....295
Lenox Instrument Co....308
Lewthwaite Machine Co., T. H....264
Lima Electric Motor Co....120
Lincoln Electric Company....176-177
Lincoln Park Industries, Inc....28
Linderme Mch. & Tool Co....382
Linley Brothers Co....160
Lipe-Rollway Corp....Inside Back Cover
Littell Machine Co., F. J....372
Lovejoy Flex. Coupling Co....243
Lucas & Son, J. L....302
Luma Electric Equipment Co....395
Lynn Manufacturing Co....252

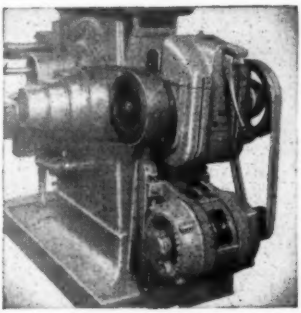
McGill Manufacturing Co....398
McMahon Co., Frank....392
Machinery Mfg. Co....73
MacWhyte Company....40
Madison-Kipp Corp....393
Mall Tool Company....293
Marshall Tool & Supply Co....339
Marshalltown Mfg. Co....231
Marvel Tool & Mch. Co....54
Master Electric Company....272
Master Gauge Co....333
Master Tool Co....349
Mead Specialties Co....325
Mercury Metal Die & Letter Co....257
Metal Cutting Tools & Mfg. Co....276
Metro-Vise Company....210
Meyer Tool & Eng. Co....354
Meyers Company ,W. F....149
Michigan Chrome & Chemical Co....204
Michigan Drill Head Co....392-395
Michigan Tool Company....221
Micro Precision Gear & Mch. Co....332
Middlesex Gauge & Tool Corp....350
Mid States Equipment Co....363
Midwest Abrasive Co....280
Midwest Hydro-Pierce, Inc....23
Midwest Tool & Eng. Co....322
Miller-Knuth Mfg. Company....296-370
Millers Falls Company....233
Milwaukee Chaplet & Mfg. Co....230
Minn-Kota Mfg. Co....394
Modern Collet & Mch. Co....24
Modern Machine Co....318
Modern Machine Tool Co....80
Modern Motor Drives Div. (Nichols Eng. Co.)....264
Modern Tools....337
Modern Tool Works....255
Molina Ind. Diamond Co., of U. S....214
Monarch Machine Tool Co....154-155
Moore Special Tool Co....271
Morey Machinery Co., Inc....297
Motor Tool Mfg. Co....110
Murchey Mch. and Tool Co....123
Murphy & Co., James A....399
Murray Mfg. Co., D. J....343

National Acme Co....107
National Machine Tool Co....44
Neubert Machine Company....262
New Britain Tool & Mfg. Co....290
New England Carbide Tool Co....66
New-Field Machined Parts Co....366
New Method Steel Stamps, Inc....399
New Plastics Corp....192
Niagara Blower Company....340
Nichols Eng. Co. (Modern Motor Drives)....264
Nichols-Morris Corp....340
Nichols & Sons, W. H....247
Nicholson & Co., W. H....379
Nicholson File Co....201
Nielsen, Inc....389
Nielsen Tool & Die Co....320
Nilson Machine Co., A. H....355
Norgren Co., C. A....141-250
Numberall Stamp & Tool Co....371

Cut PRODUCTION COSTS WITH

TORQ *MOTORS AND DRIVES*





TORQ MOTORS and Torq-Qua-Matic Drives are operating successfully in many of America's leading war plants. Combined, they comprise an efficient motorized unit that will modernize your machine tools to wartime standards, enable you to produce many more pieces per hour, cutting production costs to the bone.

Torq Motors and Torq-Qua-Matic Drives are made in standard and special sizes from 1 to 15 H.P. for all standard lathes, screw machines, millers and other machine tools.



PROMPT DELIVERY

Motors and Transmissions are available now for prompt delivery . . . from stock in most cases!

Send for Complete Catalog

THE TORQ ELECTRIC MANUFACTURING CO.
6605 CARNEGIE AVE. CLEVELAND, OHIO

Oliver Instrument Co.....170
O'Neil-Irwin Manufacturing Co.....234
Onsrud Machine Works.....386
Owatonna Tool Company.....389

Paddock Tool Co.....248
Parker Co., Chas.....369
Passman Brothers.....294-330
Peerless Machine Co.....225
Pellow Machine Tool Co.....129
Plan-O-Mill Corp.....99
Plunkett Machine Co., J. E.....324
Pope Machinery Corp.....81
Portage Machine Co.....345
Porter-Cable Machine Co.....309
Porter Machine Co.....304
Potter & Johnston Mch. Co.....229
Pratt & Whitney.....211
Precise Products Co.....364
Preis Engrav. Mch. Co., H. P.....367
Procunier Safety Chuck Co.....26
Production Machine Co.....397
Production Mchy. Develop. Co.....378
Producto Machine Co.....351
Prosser & Son, Thomas.....39
Prutton Mch. & Tool Co., D. H.....237
Putnam Tool Co.....147
Pyrometer Instrument Co.....308

Quality Tool & Die Co.....83
Quality Tool Works.....403
Queen City Machine Tool Co.....117

R & L Tools.....118
Racine Tool & Mch. Co.....179
Reading Machine Co.....166
Recor Manufacturing Co.....375
Redmer Air Devices Corp.....351
Reynolds Mchy. Co.....372
Richards Co., J. A.....320
Rieger Manufacturing Co.....329
Rivett Lathe & Grinder, Inc.....2
Robbins Eng. Co.....108
Rockford Drilling Machine Co.....142
Rockford Magnetic Products Co.....164
Rogers Machine Works.....20
Rotary File Co.....91
Rotor Tool Co.....163
Rouse & Co., H. B.....180
Rusnok Tool Works.....399
Ruthman Machinery Co.....328
Ryerson & Son, Inc., Jos. T.....132

S & S Machine Works.....392
San Angelo Foundry & Mch. Co.....316
Saw-Way Industries.....191
Saw & Knife Specialty Co.....389
Schauer Machine Co.....314
Scherr Co., George.....415
Schmarje, C. F.....332
Schmidt Inc., Geo. T.....298
Scientific Lubricants Co.....314
Sellstrom Mfg. Co.....278
Seneca Falls Machine Co.....189
Sentry Company.....112
Severance Tool Industries, Inc.....61
Sheffield Corp.....242
Sheldon Machine Co.....285
Short & Associates, J. M.....116
Sigourney Tool Co.....390
Skilsaw, Inc.....128
Smallpeice, Ltd.....343
Smit & Sons, J. K.....148
Smith & Co., D. A.....367
Smith Tool & Eng. Co.....310
Somerset Industrial Diamond Co.....370
Sossner.....50
South Bend Lathe Works.....130
Southwest Manufacturing Co.....379
Special Devices Co.....206
Specialties Manufacturing Co.....408
Stackbin Corporation.....270
Stadoil Manufacturing Co.....240
Standard Electrical Tool Co.....127
Standard Pressed Steel Co.....102
Standard Transmission Equip. Co.....250
Staples Tool & Eng. Co.....239
Star Electric Motor Co.....103
Stark Tool Company.....352
Steege Machinery Co., W. L.....320
Stokerunit Corp.....161
Stokes Industries.....38
Sturdimatic Tool Co.....42
Sturtevant Co., P. A.....77
Sundstrand Machine Tool Co.....172
Sunnen Products Co.....48
Sun Oil Co.....19
Swedish Gage Co. of America.....274
Syncro Devices, Inc.....279
Syntron Company.....357

T. & H. Mfg. Co.....278-292-322
Tannewitz Works.....88
Taylor Machine Co.....380
Templeton, Kenly & Company.....387
Thomas Hoist Company.....241
Threadwell Tap & Die Co.....145
Thriftmaster Products.....109
Tinnerman Products, Inc.....267
Torq Electric Motor Co.....417
Trico Fuse Mfg. Co.....324
Triplex Machine Tool Corp.....395
Troyke, Alfred A.....403
Tungsten Electric Corp.....75
Turner Machine Company.....283
Turchan Follower Mch. Co.....307

U. S. Hoffman Mchy. Corp.....289
U. S. Mch. Tool Mfg. Corp.....394
U. S. Tool Company.....57
Unique Manufacturing Co.....383
United Industries, Inc.....325
United Precision Products Co.....349
Universal Engineering Co.....146-184-202-371
Universal Engineering Co. (Calif.).....304
Universal Vise Company.....354

Vacuum Can Co (Duro-Chrome).....339
Van Keuren Co.....113
Vard, Inc.....21
Victor Machinery Exchange.....412-413
Vimco Manufacturing Co.....352
Vonnegut Moulder Corp.....258

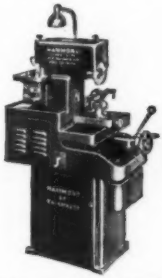
Wade Instrument Co.....324
Wade Tool Co.....62
Walker-Turner Co.....198
Walls Sales Corporation.....394
Wardwell Mfg. Co.....399
Webber Gage Company.....58
Weber Machine Corp.....363
Weldex, Inc.....392
Wells Manufacturing Corp.....29
Wesson Products Co.....251
Westcoast Diamond Tool Co.....162
Western Tool & Mfg. Co.....296
Westinghouse Electric & Mfg. Co.....215
Wetmore Reamer Company.....175
Wetzler Clamp Company.....328
Wheel Trueing Tool Co.....269
White Dental Mfg. Co., S. S.....167
Whitney Metal Tool Co.....378
Wiedemann Machine Co.....287
Willey's Carbide Tool Co.....333
Wilson, K. R.....203
Wilson Mechanical Instrument Co.....385
Winter Brothers.....104
Wittek Mfg. Co.....232
Woodworth Co., N. A.....65
Wyzenbeek & Staff.....207

Yeomans Tool Co.....369
Yost Mfg. Co.....322

Zagar Tool, Inc.....374
Zeh & Hahnemann Co.....391
Zeiss, Inc., Carl.....256

Hammond
OF KALAMAZOO

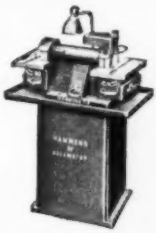
CARBIDE TOOL GRINDERS



THE HAMMOND CARBIDE TOOL GRINDER LINE IS COMPLETE — A MODEL FOR EVERY NEED FOR EITHER WET or DRY OPERATION

6" CARBIDE TOOL GRINDER

For diamond finishing grinding, increase production by using 6" machines in conjunction with 10" and 14" grinders for roughing.



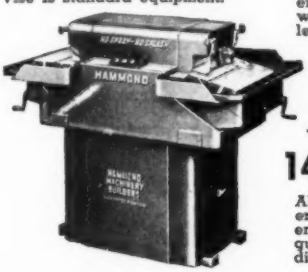
NEW HEAVY DUTY CHIP BREAKER

Handles all size tools . . . accommodates all angles . . . heavy duty, smooth, accurate, vibrationless operation . . . new, easy to read Any Angle Vise is standard equipment.

10" WET CARBIDE TOOL GRINDER

For tools up to 1", save 50% grinding time by using 10" wheels over smaller diameter wheels. Grind wet, eliminate dust problems.





14" WET GRINDER No Spray - No Splash

All Hammond Wet Grinders are equipped with patented no spray - no splash guards and new safety cup disc.

WRITE FOR BULLETIN

HAMMOND MACHINERY BUILDERS, Inc.
1614 DOUGLAS AVE.
KALAMAZOO 54, MICH.
Eastern Branch — 71 West 23rd St.
New York 10, New York

Hammond
OF KALAMAZOO





The AIR-MASTER sucks dust and grit right off the whirling wheels of grinders and buffers. Keeps the air free from these flying destroyers of health and machinery. Insures against their injuring the lungs of your employees and causing breakdowns of expensive machinery by getting into sensitive moving parts.

The AIR-MASTER is fully self contained—efficient, rugged, dependable. A size for every grinder and buffer. Write today for full details.

Now Available:
Two, three and five H.P. grinders and buffers on AA5 priority or better.

The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.
DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

3702-10 MADISON RD.

SPEED + PRECISION ECONOMY

. . . PLUS HYDRAULIC VERSATILITY FOR QUICK CHANGE-OVER TO NEW PRODUCTS



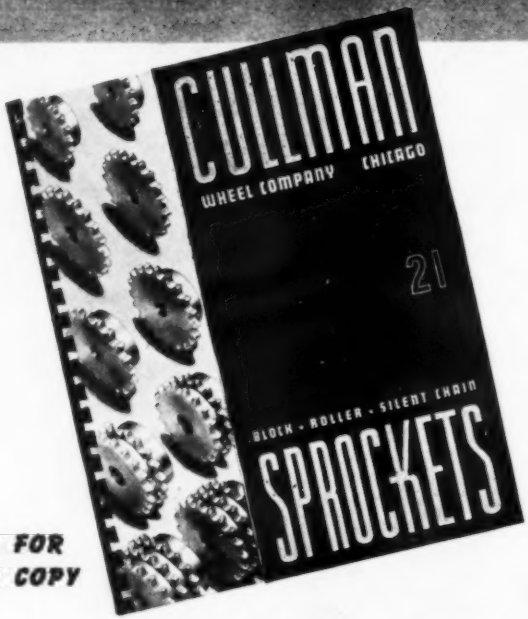
Fully automatic with hydraulic holding equipment, feeds, tailstock quill. Swing over bed 15", over carriage 8", between centers 30"

Designed especially for carbide tools, the Lipe Carbo-Matic Lathe gives you full advantage of modern "man-made diamond" cutting tools. It has the rigidity and brute power for fast, heavy hogging or intermittent cuts on high brinell steels . . . the high spindle speeds for efficient precision finishing to tolerances as close as .0005" . . . and the automatic "know how" which carries a cycle to completion without help from the operator. Labor costs, tool costs and scrap costs are lower. Adjustment, cleaning and re-setting are simpler.

It has the versatility for quick change-over to new products or parts. Feed rates, traverse rates and sequence of motions are hydraulically controlled, permitting almost infinite variation. Speed changes range through 198 different steps from a low of 59 to a high of 3,100. It is a lathe you can rely on . . . a lathe that will give you the very qualities you'll need most in a post-war world of change, obsolescence and new products.

ARMY E NAVY

LIPE-ROLLWAY



SEND FOR YOUR COPY

HOW TO ORDER SPROCKETS

If you specify or buy sprockets, you should write immediately for the Cullman Wheel Company Sprocket Catalog.

It contains much essential information of value. It lists thousands of sprockets available both from stock and to order. It describes many different styles and kinds. It tells how to select the correct chains and sprockets, and gives valuable information on installation, lubrication, and care of high speed roller chain drives.

The Cullman Wheel Company Sprocket Catalog gives much useful data and many tables that will help save time and money for those who order or specify sprockets.

More than 50,000 Sprockets in Stock

CULLMAN WHEEL COMPANY

1350 West Altgeld Street Chicago 14, Illinois